



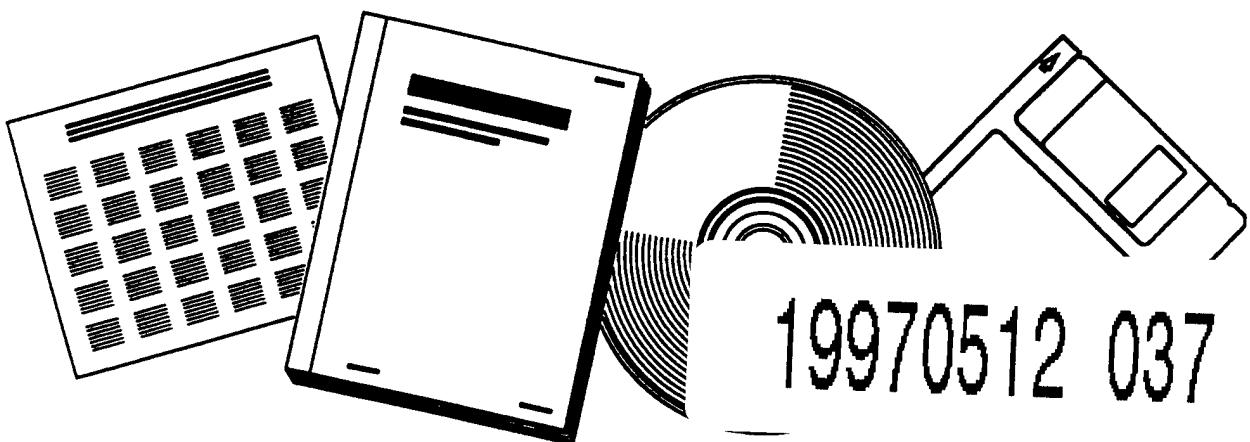
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DEFENSE DRAWDOWN: FINANCIAL OVERVIEW AND STRATEGIES FOR THE TOP 25 PRIME CONTRACTORS ANNEX E TO ADJUSTING TO THE DRAWDOWN REPORT OF THE DEFENSE CONVERSION COMMISSION

DEFENSE CONVERSION COMMISSION
WASHINGTON, DC

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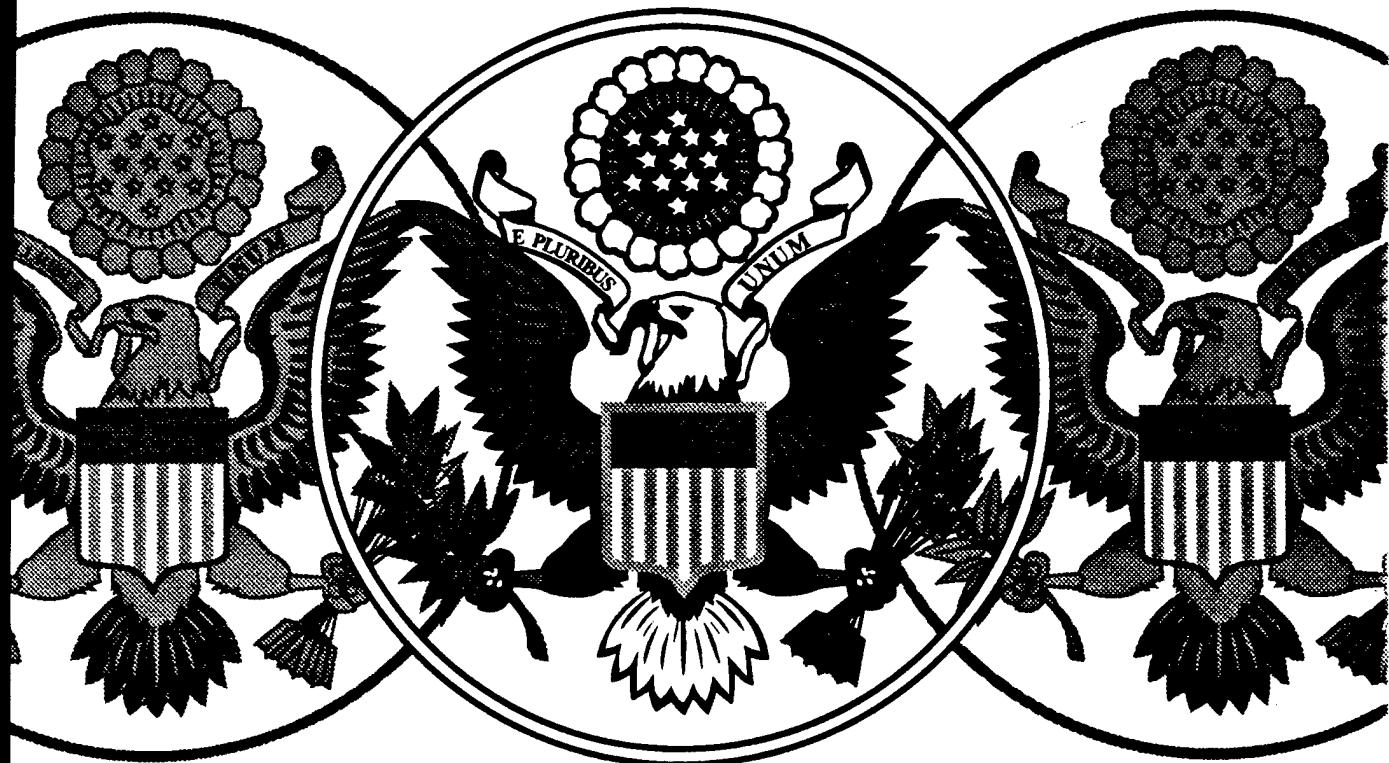
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Defense Drawdown: Financial Overview and Strategies for the Top 25 Prime Contractors



Annex E to
Adjusting to the Drawdown

Report of the
Defense Conversion Commission

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Defense Conversion Commission

February 1993

Prepared by: David J. Platt

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Abstract: The report examines the impact the defense drawdown will have on the top twenty-five defense contractors. The analysis looks at the financial viability of the firms, the strategies the firms will undertake, and whether or not they will pursue commercial opportunities. It concludes: the top defense firms view the decline in defense spending as permanent, not cyclical; the financial viability of the firms is not at risk; commercial diversification will be based on the firm's 'core competencies' and firms will pursue modest commercial ventures. An analysis of the financial performance of the prime contractors during the 1980s and early 1990s and an examination of the financial projections for the top prime contractors is included.

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INTRODUCTION

The U.S defense industry faces a challenge over the next five years unmatched by any previous defense drawdown since World War II. A challenge unmatched not in terms of outlays or as a percent of gross domestic product but unmatched in terms of *permanence*. Defense spending in FY1997 will be \$70 billion less, in constant FY1993 dollars, than in FY1992. By FY1997, DoD outlays will decline over \$100 billion or 30 percent since the end of the Reagan buildup.

Procurement outlays compared to outlays for other types of defense spending will experience the sharpest decline. By FY1997, procurement will decline almost \$46 billion or 46 percent. Expressed in annual rates of change, procurement will decrease on average 5.2 percent per year while total spending will decline almost 4 percent per year. Procurement outlays pay for the purchases of weapon systems and equipment and directly affect defense contractors who provide these systems and equipment.

Faced with this permanent downsizing, defense contractors' financial and business strategies are focusing on survivability, not growth. When a market shrinks by 46 percent in real terms over a five-year period, firms face enormous financial pressures and business uncertainty, especially when they have relied on a single customer - the Pentagon. How these companies will face these pressures and uncertainties and the role the Department of Defense will play is the focus of this Annex to the report of the Defense Conversion Commission.

The defense industrial base is not a monolithic entity, particularly in terms of size, capabilities, and defense sales as a percentage of corporate revenues. Defense contractors comprise a variety of large, medium, and small corporations and contain diverse segments not only in the systems and equipment they produce but also in terms of their relationship within the parent corporation. When someone is asked to name the top 25 DoD prime contractors, companies such as McDonnell Douglas, Martin Marietta, General Dynamics, Grumman, Lockheed, and Northrop come to mind. However, other companies such as General Electric, Westinghouse, General Motors, Boeing, International Telephone and Telegraph, and Texas Instruments are also major DoD prime contractors.

The discussion of the defense industrial base in this Annex draws from a number of sources including studies and articles as well as input from

industry associations and companies to the Defense Conversion Commission, hereafter referred to as Commission. Finally, the discussion on the financial overview and business opportunities draws from a study undertaken by Data Resources, Inc./McGraw-Hill (DRI) for the Commission as well as a Department of Defense study and independent analysis by Commission staff. The findings on business strategies as a result of the defense drawdown are based on the review of these sources and are noted throughout the discussion.

A major finding in DRI's study is that the twenty-five top prime contractors "will successfully manage the decline in defense spending and sustain the financial conditions necessary for a strong industrial base."¹ According to another study, "to survive, let alone prosper and carry a positive margin and reach a profitable end state, contractors have to make cuts that outpace declining revenues. Instead of growing faster than their industry is growing, they have to shrink faster than their industry is shrinking - roughly seven percent per year."² Finally, "the strategies must recognize that the ultimate objective of consolidation is the reduction of excess capacity in the aerospace/defense industry."³

THE U.S. DEFENSE INDUSTRIAL BASE

The Department of Defense (DoD) defines the industrial base as the capacity of industry to produce goods and services that DoD needs to meet its mission requirements.⁴ The defense industry shares the same industrial base with the commercial firms, consists of many thousands of companies, and consists of technology development as well as production. The defense business is not a distinct industry; rather, it is comprised of business segments within large U.S. corporations and thousands of smaller firms. Defense contractors are located in approximately 40 major industries ranging from aircraft and electronics to petroleum refining and scientific instruments.⁵ The defense industrial base is a diverse entity not a monolithic entity. The distinction between defense and commercial firms lies not in the makeup of the industry or the firms, but rather the markets in which the firms operate.

The diversity of the U.S. defense industry can be defined by the structure of the industry, the customer, and the types of items produced or services provided. There exists an interrelationship between the structure of the defense segments within U.S. corporations, the military or defense market, and the products manufactured and services provided. This interrelationship is characterized by the sectors or "submarkets" within the military market. These submarkets, which comprise the predominant share of the military or defense market, pertain exclusively to weapon systems and include aircraft, missiles and space, electronics, ships, and combat vehicles. In FY1992, these five sectors accounted for 58 percent of the total amount of procurement awards for contracts greater than \$25,000 and 52 percent of the total amount of all procurement awards.

The defense industry has been defined as a "dual economy" consisting of two "levels" - prime contractors and subcontractors.⁶ The delineation between primes and subcontractors has to do with the way business is conducted and the way the item is produced. Prime contractors, for example, specialize in defense marketing and system integration. They have responsibility for the design, development, and production of major weapon systems. They do not necessarily perform all of the work themselves. Instead, they subcontract development and production to other firms.

Subcontractors usually span many sub-tier levels. Second-tier contractors supply components, sub-assemblies, specialty materials, and other items - including services - to the prime contractors. They are often

responsible for the integration and assembly of products or systems for weapon system integration. Third and lower-tier subcontractors produce standardized parts and materials that are usually found in non-defense markets. On average, the share of the prime contract award to subcontractors varies from 40 to 60 percent.⁷

The defense industry can be characterized as possessing a high level of concentration, varying degrees of sensitivity of corporate revenues to defense-related businesses, operating in a regulated market, and product differentiation. The level of concentration in the defense industry is illustrated in Table E.1. Of all the contract awards over \$25,000, the top prime contractors received almost 44 percent of the total contract dollars. Of *all* the contracts awarded in FY1991, the top prime contractors received \$59.9 billion, or 39.7 percent, of the \$150.9 billion awarded.

Table E.1 also reveals that almost all of the top prime contractors firms in FY1987 were also among the top firms in FY1991 in terms of total value of contract awards. Only one, Loral Corporation, was not in the top 30 in terms of total value of contract awards in FY1987 but was in FY1991.

The concentration of total dollars in a relatively small number of firms does not mean that these firms are "defense-dependent" companies. Among the top DoD prime contractors studied, defense revenues amounted to an average of 25 percent of total corporate revenues (Table E.2). However, the degree of "sensitivity" or "exposure" to defense spending varies. For instance, the percentage of defense/space revenues to total revenues ranged from a high of 100 percent for Alliant Techsystems, Inc. to a low 5.1 percent for GTE.

Although the defense industry is part of the U.S. industrial base, there are differences between commercial and defense businesses. The major difference is the market in which they operate. A market defined by the types of products, the number of buyers and sellers, and the determination of price. Table E.3 presents a comparison between civilian and defense firms. While Table E.3 presents an abstraction of the differences, the intent is to highlight the key differences between civilian and defense firms and markets. An understanding of these differences is paramount to understanding the operations and financial performance of defense versus commercial businesses.

As Table E.3 shows, the federal government, not the market, negotiates the price, output, and profit levels. Essentially, the U.S. defense industry

does not operate in a free and competitive market, it operates in a *regulated* market. A competitive market consists of an inter-related group of buyers and sellers all of whom have full information about products and prices, where there is free entry to the market for sellers and buyers, and where no individual buyer or seller is large enough to influence the terms of trading. A regulated market, on the other hand, includes high levels of concentration, barriers to entry and exit, and highly specialized and segregated products.

The attributes of a regulated market, i.e., high levels of concentration, barriers to entry and exit, highly specialized and segregated products, and market power of one buyer, pertain to the defense industry, specifically to the procurement of weapon systems, and not to commercial products and services bought by DoD. While these attributes can be found in other regulated markets, banking and electric utility industries for example, the defense market is unique in that there is only one buyer. Regulation in the defense market is not accomplished through an independent regulatory agency, but rather through the dominant market position of the Department of Defense.

The defense market for weapon systems consists of segmented sectors or "submarkets" and each submarket may consist of a few or many suppliers, yet there is only *one predominant buyer* - the Pentagon. The Department of Defense is the only customer for items such as aircraft carriers, supersonic bombers, ICBMs, and nuclear submarines. In its dealings with companies or divisions of companies that cater primarily to the military market, the Department of Defense assumes many of the management decisions about policy and procedures that are usually made by the companies in the commercial market. This decision-making role by DoD pertains mainly to the procurement of weapon systems and takes three major forms: (1) determining the choice of weapon systems the defense firms produce, (2) influencing the source and amount of financial capital they use, (3) and supervising companies' internal operations.⁸

Another attribute of a regulated market is the presence of barriers to entry and exit - characteristics found in the defense business. Barriers to entry include high capital investments in specialized machinery, brand loyalty by the military services, high levels of engineering and technical skills, large cash reserves, specialized reporting requirements, security clearances; and knowledge of detailed federal regulations.

Barriers to exit or diversification to civilian business are no less significant. They include government ownership of R&D, large overhead for defense work, unique capital equipment, and the specialization of labor.

While specific aspects of a regulated market have been covered including barriers to entry and exit, the presence of one buyer, and the high levels of concentration in the industry, there are two other aspects of the defense market that are regulated by the Department of Defense - products and financing.

DoD's procurement of goods and services falls into three categories: weapon systems, dual-use items, and commercial items. While a few weapon systems may take a majority share of the billions of dollars of annual procurement, the Pentagon also purchases billions of dollars of commercial items as well. These items include office equipment and supplies, food, clothing, medical and dental supplies, and construction equipment. In FY1983, commercial goods and services amounted to \$37.8 billion, or 30 percent, of the total contract award dollars. However, the predominant share of the Department's purchases is for highly expensive, technologically complex, militarily-unique item for which prices are negotiated by DoD and its contractors rather than established by the market.⁹ In essence, for militarily-unique items, the Pentagon is the market.

Features of many militarily-unique products compared to commercial products are:¹⁰

- Technologically complex because the missions they perform have become increasingly difficult in a rapidly changing environment;
- Expensive because of technological complexity;
- Produced in low volume;
- Highly reliable and maintainable in order to perform their mission in hostile environments with minimal repair costs;
- Long in development; and
- Produced in a "regulated" market.

Because of the level of business concentration, the type of market, and the types of products; a two-way relationship exists between industry and the Department of Defense. A relationship evolving over time and creating

defense-oriented and government-oriented businesses and corporations. A relationship where business cannot exist and succeed without DoD, and DoD depends on the performance and availability of these firms. One of the relationships is a source of working capital available through the federal government to defense contractors. This source is called progress payments.

Although in principle defense contractors are expected to finance their activity from private sources, contracting officers may grant progress payments as a source of financing for working capital under the following conditions:¹¹

- The contract or group of contracts exceed \$1 million;
- There is a substantial period of time between when work commences and when products are delivered; and
- The contractor's expenditures before product delivery have a significant impact on working capital requirements.

The customary progress payment for large businesses is currently 85 percent and 90 percent for small businesses. DoD applies this rate to a contractor's incurred costs such as direct and indirect labor, material, payroll accruals, and overhead. The reason for progress payments is to minimize the cost to the government for weapon systems. The government realizes lower costs in two ways: lower contract prices and lower borrowing costs by the government. Military procurement regulations provide an incentive for companies to use government working capital. If companies decide to seek private financing for working capital, they are not allowed to charge interest payments to government contracts.

However, the absence of a free market does not mean that defense companies do not make financial decisions and have objectives similar to publicly-held corporations in the commercial sector. Almost all of the prime contractors are publicly held corporations, and management has a fiduciary responsibility to its shareholders. They invest in capital assets, seek financing for investments, and attempt to make a profit - all actions identical to those undertaken by commercial firms.

With the current downsizing in the Department of Defense, is the defense industry at risk? Will the firms comprising the defense industry survive the downsizing, and if so, what will the industry look like in the next three to five years? Will these firms look to the commercial markets

for salvation? In order to answer these questions, let's examine five major procurement categories - aircraft/aerospace, electronics, shipbuilding, missiles and space, and combat vehicles.

Aircraft, electronics, shipbuilding, missiles and space, and combat vehicles represent over 50 percent of the total procurement award dollars in FY1991 and FY1992. As Figures E.1 and E.2 show, total procurement dollars for these categories amounted to \$67.6 billion (\$72.0 billion measured in constant FY1993 dollars) and \$60.9 billion (\$62.9 billion in FY1993 dollars) for FY1991 and FY1992 respectively. Figures E.1 and E.2 also reveal that all five categories experienced significant declines both in current and constant dollars since FY1985. While aircraft, missiles and space, and electronics had double-digit average annual real growth between FY1981 and FY1985, these sectors experienced dramatic declines in current and constant dollars between FY1985 and FY1992. Before we discuss what the financial effects this decline and the future drawdown will have on defense contractors, let's review the business makeup and outlook of each of these sectors.

AEROSPACE

The aircraft/aerospace industry consists of hierarchical tiers.¹² First, there are the prime contractors consisting of Boeing, McDonnell Douglas, Grumman, Lockheed, and General Dynamics to name a few. Second, there are the system manufacturers such as General Electric and United Technologies (Pratt & Whitney) for engines. Finally, there are the third and sub-tier contractors who manufacture materials such as aircraft forgings.

The aerospace industry is noted for its high degree of concentration. In the U.S. there are only two producers of large commercial transport aircraft - Boeing and McDonnell Douglas. Internationally, the market is very concentrated with three companies - Boeing, McDonnell Douglas, and Airbus Industrie - controlling ninety-five percent of the total dollar of the free world's 1989 commercial production.

In 1989, there were only two manufacturers controlling one hundred percent of the strategic bomber production in the U.S. They were Boeing Military Company, the prime contractor producing modification kits for the B-52, and Northrop Corporation, the prime contractor for the B-2 bomber. Rockwell completed its production run of the B-1 in 1988.

The production of fighter/attack aircraft comprises three manufacturers - Grumman, McDonnell Douglas and General Dynamics pending the sale to Lockheed. The DoD plans to cease production of most major aircraft systems, i.e., the F-14, the F-15, and the F-16, during the next five to ten years. The only fighter aircraft for the next several years is the Advanced Tactical Fighter contract comprising of the team of Lockheed, General Dynamics, and Boeing.

Besides the high level of concentration, the aircraft/aerospace industry is also noted for its formidable barriers to entry. These barriers include:¹³

- Labor intensiveness - in the aerospace industry, labor costs absorb one-third of the revenues. In large research projects or in early production stages, labor costs may be higher. This is characteristic of a long, steep learning curve.
- Capital intensiveness - a new aerospace project requires large amounts of capital. Industrial College of the Armed Forces (ICAF) estimates that it costs approximately \$4.0 billion to launch a new aircraft.¹⁴
- High technology requirements - the technology required to design, develop, and manufacture an aircraft steepens the learning curve.
- Manufacturing history - new entrants lack a track record.

In FY1991, the aircraft procurement sector accounted for \$23.6 billion (\$25.2 billion measured in constant FY1993 dollars), or 18.8 percent of the total procurement dollar awards (Figures E.1 and E.2). In FY1992, the dollar amount increased to \$24.0 billion (\$24.9 billion in FY1993 dollars), or 20.5 percent, of the total dollar awards. Throughout the 1980s and early 1990s, this sector had been the largest component of procurement award dollars. However, the rapid growth in procurement in the aircraft sector during the early and middle 1980s had not been matched during the late 1980s and early 1990s. In fact, total procurement dollars remained around \$24.0 billion (current dollars) since FY1989.

According to the recent 10-year forecast by the Electronic Industries Association (EIA), procurement for aircraft will decline from \$19.3 billion in FY1993 to \$16.0 billion by FY1997 (constant FY1993 dollars). Budget authority for RDT&E for the aircraft sector will also decline over the next five years. By FY1998, budget authority will decline to \$4.6 billion (constant FY1993 dollars) from \$7.8 billion in FY1993.

ELECTRONICS

While the aircraft sector will experience a significant decline in procurement and RDT&E, the defense electronics industry will experience a modest decline (constant dollars) in procurement and RDT&E authority over the next four to five years. The defense electronics industry comprises a range of capabilities from design, manufacturing, assembly and integration to only design and integration. The defense sector includes both stand-alone electronic systems and systems embedded into aircraft, missiles, ships, and combat vehicles. The evolution of the electronics industry can be illustrated by the fact that the memory capacity of semiconductor chips quadruple every three or four years while the price has steadily declined. The performance of microprocessors has improved more than fifty percent per year.

While the aerospace industry is dependent upon the Department of Defense, the electronics industry is less reliant. Although DoD is an important market for the electronics industry - 21.9 percent of its 1989 sales were to the defense electronics market - defense electronics products are frequently a "spin off" from commercial electronics and not vice versa. Not long ago, heavy involvement of military electronics research and development produced spin-offs in commercial application. Today, much of the "high tech" military capability is built upon the electronics industry.

However, fully commercial "off-the-shelf" systems, while they meet or exceed defense standards, are not integrated systems capable of providing command, control, communications, and intelligence (C3I).¹⁵ The prime contractor's task is to constantly remain competitive with the commercial market while at the same time integrating military systems.

The electronics industry is divided into commercial and defense electronics companies. Commercial companies include Litton, Texas Instruments, Unisys, Motorola, Harris, and Westinghouse Electric. While labeled commercial companies, they also operate in the defense market. For example, defense sales from Litton, Texas Instruments, Unisys, and Westinghouse Electric accounted for 25 to 47 percent of total corporate sales (see Table E.2). Large defense electronics companies include Alliant Techsystems (spin-off from Honeywell), EG&G, ESCO Electronics, E-Systems, Loral, M/A-COM, and Watkins-Johnson. Defense revenues for these companies comprise a predominant share of total corporate sales. For example, defense sales accounted for all of Alliant's corporate revenues and over 75 percent of Loral's (see Table E.2).

According to Electronics Industries Association, procurement spending in the electronics and communications sector will decline by \$0.5 billion in constant dollars between FY1993 and FY1997. RDT&E spending will also decline by approximately \$0.6 billion in constant dollars over the same period. According to a DoD study, many of these firms benefit from a strong base of commercial sales and should be able to adjust to the decline in procurement and RDT&E authority. How firms plan to adjust to the drawdown is the subject of the next section.

SHIPBUILDING

The shipbuilding and repair industry comprises four distinct segments. They are military construction, military repair, commercial construction, and commercial repair. According to an ICAF study, these sectors are separated by formidable barriers to entry and exit. Military work, as compared to commercial construction, must meet a higher standard of quality, involved frequent changes during construction, requires higher overhead to meet contracting requirements. Navy shipbuilding requires a wide variety of materials and extensive outfitting.

Another important sector of the U.S. shipbuilding industry is the second-tier shipyards. This segment consists of small-size and medium-size facilities that support inland waterway and coastal carriers. Their market consists of tug boats, supply boats, ferries, barges, and small military and government-owned vessels.

The U.S. shipbuilding industry had a balanced mix of commercial and Navy business until 1980. Since 1980, the building of new merchant vessels has declined dramatically while the U.S. Navy began the largest ship construction program in peacetime history. According to data provided to the Commission by the Shipbuilders Council of America, new merchant vessels under construction at U.S. private shipyards declined from 69 in 1980 to zero in 1988 through 1990, while expanded Navy shipbuilding eased the loss of commercial work. During the 1980s, the Navy's shipbuilding program had an annual average of 19 ships.

The outlook for the shipbuilding industry will depend on the Navy shipbuilding and repair activity. The Navy's proposed FY1993-1997 shipbuilding program includes construction of 35 new ships, or between five and seven ships per year, costing about \$33 billion. According to a Department of Commerce report, the value of shipyard contracts is only about one-third of this amount. The Navy's proposed long-term program

is a significant reduction compared to previous programs and will create significant excess capacity in the shipbuilding industrial base. The projected decline in naval construction will be the most important challenge for the U.S. shipbuilding industry because commercial shipbuilding is projected to remain weak.

The three largest U.S. shipyards, General Dynamics (Electric Boat), Litton (Ingalls Shipbuilding), and Tenneco (Newport News Shipbuilding and Drydock) are divisions or subsidiaries of large corporations. According to a DoD study, shipbuilding sales accounted for an average of less than 25 percent of total corporate revenues.¹⁶

MISSILES AND SPACE

The missiles and space sector includes items such as ballistic and tactical missiles, launch vehicles, and spacecraft. From FY1982 through FY1991, this sector represented 12 to 15 percent of total procurement dollars (see Figures E.1 and E.2). However, the share of total procurement dollars in FY1992 fell below 12 percent for the first time since FY1981.

According to the Department of Commerce, shipments of U.S. missile systems, space launch vehicles, and related equipment are expected to decrease at a real rate of 6 percent in 1993.¹⁷ The decline in the missile segment is attributed to the decline in the defense industry, while the decline in the space launch industry is due to stagnant non-defense demand.

DoD's missile procurement budget is spread across a number of prime contractors including GM Hughes, Martin Marietta, Loral, Raytheon, Rockwell, TRW, McDonnell Douglas, Boeing, and Texas Instruments.

COMBAT VEHICLES

The combat vehicle segment is the smallest of the five procurement categories. Total procurement awards amounted to \$3.0 billion (\$3.2 billion in FY1993 dollars) in FY1991 and \$1.3 billion (\$1.3 billion in FY1993 dollars) in FY1992 - or approximately seven percent of the total procurement dollars for both years. Most of the funding went for the procurement of the M1 Abrams Tank and the Bradley Infantry Fighting Vehicle.

There are three major contractors for Army combat vehicles: General

Dynamics Land Systems, FMC's Defense Systems, and Harsco's BMY division. FMC produces the Bradley Infantry Fighting Vehicle, General Dynamics the M1 Abrams Tank, and Harsco the M109 Howitzer. In addition to the combat vehicles, the major contractors for wheeled vehicles are Harsco and Oshkosh Truck Corporation.

Procurement of combat vehicles experienced the sharpest decline of the five procurement categories since FY1985 both in current and constant dollars. As Figures E.1 and E.2 show, procurement dollars awards declined at an average annual rate of 12.0 percent in current dollars and an average annual rate of 15.0 percent in constant dollars. According to the 10-year EIA forecast for vehicle procurement, budget authority is expected to decline from \$1.8 billion (FY1993 dollars) in FY1991 to \$1.6 billion (FY1993 dollars) by FY1997.

FINANCIAL VIABILITY

What effect the defense drawdown will have on the financial viability of the top DoD prime contractors? Will they survive the drawdown? Are there non-defense markets available to defense contractors to make the shortfall in defense revenues?

As a starting point, the Defense Conversion Commission asked DRI/McGraw-Hill to examine the impact the drawdown will have on the top twenty-five defense contractors. DRI's analysis looked at the financial viability of the firms, the strategies the firms will undertake, and whether or not they will pursue commercial opportunities. DRI concluded:¹⁸

- the top defense firms view the decline in defense spending as permanent, not cyclical,
- the financial viability of the firms is not at risk, and
- commercial diversification will be based on the firm's "core competencies" and firms will pursue modest commercial ventures.

An analysis of the financial performance of the prime contractors during the 1980s and early 1990s and an examination of the financial projections for the top prime contractors follows.

FINANCIAL PERFORMANCE OF THE TOP PRIME CONTRACTORS

How companies respond to the "downsizing" of defense is important not only to management and shareholders of the company, but also to the Department of Defense and the American taxpayer as well. This dramatic reduction presents a serious challenge to the financial stability of U.S. defense companies. Their financial performance and health will determine the ability of the nation to maintain key manufacturing capabilities in the short and long-term. How the defense contractors maintain financial viability in the face of these dramatic cuts is the topic of this section.

Defense drawdowns are not new. Since World War II, there have been four post-war drawdowns: post World War II, the Korean War, the Vietnam conflict, and the current post-Cold War. Defense companies survived the previous drawdowns by increasing exports, diversifying into nondefense related activities, or adapting military products for commercial applications. However, unlike the post-Korea and Vietnam drawdowns, defense contractors view the post-Cold War decline as permanent not cyclical.

A permanent reduction will force contractors to develop long-term strategies and ultimately reduce the number of contractors. As stated previously, the cuts will require contractors heavily dependent on defense revenues, to consolidate. Other contractors less dependent on defense business will either disinvest or create distinct defense segments.

The primary goal of most publicly-held companies is to maximize shareholder wealth. American corporate goals are centered on earning high returns on investment and maximizing "shareholder value" measured by the current stock price. Companies achieve this goal by using investors' resources to provide products and services to markets which will provide an adequate return based on an acceptable level of risk. The returns to the investor, either holders of debt or equity, must be greater than risk-free instruments over a certain period of time.

MEASURES OF FINANCIAL PERFORMANCE PROFITABILITY

In order to evaluate the effects the defense drawdown has had and will have on the top prime contractors, let's examine business performance by deriving and analyzing specific financial ratios. The analysis compares the financial ratios for the past, present, and future for the top prime contractors. An evaluation over a period of time will enable us to determine whether or not there has been and will be improvement or deterioration in the financial condition and performance in the corporation.

The financial ratios from the viewpoint of management will be discussed.¹⁹ Management's analysis of financial performance is used to assess both efficient and profitable operations and the effective use of resources. Three areas of financial performance are: operations, asset management, and profitability. There are a number of measures employed in each of these areas. For example, measures of operational analysis include gross margin, profit margin, and contribution margin. Asset management indicators include asset turnover and analysis of working capital. Finally, profitability from management's perspective is measured by return on assets and earnings before interest and taxes (EBIT).

There are three measures that will be derived and analyzed: return on sales, asset turnover, and return on assets. *Return on sales (ROS)* is a measure of operating efficiency and *is defined as the ratio of profit to sales* and is commonly referred to a "profit margin." This ratio is important to managers because it reflects a company's pricing strategy and its ability to control operating costs.

There are a number of measures of profit such as earnings before interest and taxes (EBIT) or net operating profit, pretax income, or net income. In this report, we will employ EBIT because it represents profit before any compensation is paid to debtholders and before payment of taxes. Because debtholders provide credit which supports part of the total assets, there is a "fallacy" in omitting interest expense especially when using return on assets (ROA) as the measure of profitability.²⁰ The use of EBIT rests on the belief that it provides a "purer" measure of operating performance undistorted by financial leverage and taxes. Another reason for using EBIT is that the analysis of the aerospace/defense industry later in this Annex will compare the performance of defense segments of a corporation with the performance of the corporation. Payment of interest expenses and taxes apply to the whole corporation and cannot be allocated between defense and non-defense segments.

The second category, asset management, judges the effectiveness by which management employs a company's assets. The most commonly used ratio to measure effectiveness, and the one employed in this study, is the *asset turnover ratio*. This ratio is defined as *net sales to total assets*. It essentially indicates the size of assets required to support a particular level of sales, or the amount of sales dollars generated by each dollar of assets. The higher the ratio, the more effectively plant and equipment and current assets are being employed. At a time when sales are down and physical facilities are not being used to capacity, the ratio will tend to decline.

The relationship of net operating income to sales measures operating performance. The relationship of sales to total assets measures asset utilization. Both measures determine the return on a given investment in assets or *profitability*. That is, *the product of return on sales and the asset turnover ratio equals return on assets (ROA)*. The achievement of satisfactory profitability (ROA) depends not only on a healthy profit margin but also on how quickly the investments "turn over."²¹ However, we will employ caution in interpreting these measures because the asset turnover ratio as well as return on sales are complex ratios and require thorough analysis before definitive conclusions can be reached on a firm's performance and profitability.²²

The analysis of the financial performance of DoD prime contractors is divided into three sections. The first section will present and discuss the three financial measures mentioned above - return on sales (ROS), asset turnover ratio, and return on assets (ROA) - from 1981 through 1991. The second section will discuss the financial performance of the aerospace/defense industry with a focus on the defense segments of this industry. The final section will present financial projections with a discussion of possible strategies for the prime contractors. These projections are derived from the DRI study.

The analysis divides the 25 prime contractors into four categories: extremely exposed, highly exposed, moderately exposed, and minimally exposed. These categories, developed by DRI, are based on the percentage of corporate revenues derived from defense/space activities.²³ Contractors included in the "extremely-exposed" category have 70 percent or more of their revenues from defense business, "highly-exposed" contractors between 30 and 70 percent, "moderately-exposed" contractors between 15 and 30 percent, and "minimally-exposed" contractors less than 15 percent. The financial results presented for the top prime contractors include both defense and non-defense activities.

HISTORICAL FINANCIAL PERFORMANCE OF THE TOP DoD PRIME CONTRACTORS

Figures E.3 through E.7 illustrate the three measures of financial performance for the prime contractors and the four "defense-dependent" categories for two periods: 1981-1987 and 1987-1991. (Please note: the discussion of return on assets, asset turnover ratio, and return on sales pertain to the categories of defense dependency and not to individual companies; company ratios may vary within the aggregates in these categories.) Overall the large contractors experienced two distinct periods of profitability. Between 1981 and 1987, return on assets averaged 11 percent for the prime contractors, while profitability averaged slightly less than nine percent between 1987 and 1991. Return on assets declined steadily from 11.1 percent in 1988 to 6.7 percent by 1991. Examining the average return on sales and the average asset turnover ratio, the decline in profitability is attributed to the dramatic decline in asset utilization. In fact, the average return on sales for the prime contractors was higher during the late 1980s and early 1990s but not enough to offset the dramatic decline in asset utilization. While the defense contractors' operating efficiency during the late 1980s and early 1990s outperformed the pre-1987 period, the turnover of investment is lower. A high profit margin alone does not necessarily reflect a healthy condition unless the firms earn a satisfactory return on their assets. Therefore, another important determinant of asset profitability is the utilization of a company's assets.

Asset turnover ratios measure "the intensity with which assets are utilized."²⁴ Asset utilization measures the level of sales generated by a level of assets. For example, the asset turnover ratio of 1.32 in Figure E.3 means \$1.32 of sales were generated for each dollar invested in assets. Assets are classified as either "working capital assets" or "long-term investments."²⁵ To determine the reason for the dramatic decline in asset utilization, each asset category such as cash, accounts receivable, etc., in its relationship with sales should be evaluated. For example, a low turnover ratio may be due to holding unnecessary cash balances, overextension of credit, overstocking of inventories, or excess capacity.

Assets compared to sales grew at a much faster rate during the 1987-1991 period than they did during the 1981-1987 period. Table E.4 and Figures E.8 and E.9 compare the average annual growth rates for assets and sales for both periods and for the four categories. In each of the "defense-exposure" categories, the growth rate in assets over sales was much higher during the late 1980s and early 1990s than during the pre-

1987 period. In fact, for the extremely-exposed category of defense firms, the rate of increase in assets rose from 1.12 times to almost 12 times the rate of growth in sales.

This dramatic growth in assets over sales explains the decline in the asset turnover ratio and subsequent lower profitability ratios experienced in the late 1980s and early 1990s. As Figures E.4 and E.7 show, the operating efficiency, return on sales, of the prime contractors, except the extremely-exposed contractors, improved during the later half of the 1980s. Average return on sales during this period was higher for three of the four "defense-exposure" categories. This may be attributable to the performance of the non-defense segments of the corporations.

Examining the turnover ratio in Figure E.3 reveals that in each year since 1984, the ratio had been steadily declining. A factor that may have attributed to the decline is the change in the amount of progress payments paid to defense contractors. In May of 1985, the progress payment rate was adjusted downward from 90 to 80 percent and reduced again to 75 percent in October, 1986. Since progress payments are a "contra asset" account, a firm's accounts receivable or inventories on the balance sheet statement is net of progress payments. Progress payments and advances may account for as much as 60 percent of total assets. If the rate is lower, the amount of progress payments is lower and the current assets will be higher given the same level of sales. Hence, a lower rate with a given level sales will yield a smaller asset turnover ratio because the denominator (total assets) will be larger all other factors remaining constant.

While changes in the progress payment rate may have an effect on the asset turnover ratio, it may not be the only effect. For example, the payment rate was adjusted upward to 80 percent for large companies in October, 1988, and adjusted upward again to 85 percent in July, 1991. However, from 1988 until 1991, the asset turnover ratio *continued to decline*. Therefore, the steady decline in asset utilization cannot be solely attributed to the changes in the progress payment rates. The change in the progress payment rate applies to new contracts and the impacts may not occur for a number of years. This relatively long-term pattern may suggest that the low turnover ratio in recent years could be attributed to excess capacity and the underutilization of plant and equipment in the defense industry. While the sales margin, i.e., return on sales, may appear satisfactory or even superior but the turnover of the related investment is low, this "would be the case where capacity utilization is low."²⁶

It would be difficult to argue that the excess capacity is the result of the drawdown in defense. Examining the asset turnover ratio for the prime contractors in the moderately and minimally exposed categories shows the same "level" or decline in the ratio as the "defense-dependent" contractors. This comparison suggests that companies with less exposure to changes in defense revenues experienced the same decline in asset utilization as companies with high exposure to defense revenues. If the reason for low asset turnover ratios is excess capacity in the defense industry, then only the extremely-exposed and highly-exposed categories would show a much larger decline compared to the moderately and minimally-exposed contractors. However, since all categories experienced a similar decrease, excess capacity may be a U.S. industrial base issue not just a defense industrial base issue.

The decline in profitability (ROA) experienced by defense contractors can be attributed to the underutilization of assets and lower profit margins for defense segments in the 1980s. This applies to all 25 prime contractors, not just "defense-dependent" ones. The question remains as to whether or not the decline in the turnover ratio is attributed progress payment reductions or excess capacity or both. The analysis up to now is not conclusive. This issue will be discussed further when the financial performance of the aerospace/defense industry is discussed. However, one indicator pertaining to the extremely-exposed contractors needs further discussion - return on sales.

The decline in the financial performance of the extremely-exposed contractors during the late 1980s and early 1990s had been affected not only by underutilization of assets but lower profit margins as well. While the other three categories of contractors experienced on average higher profit margins levels during the late 1980s, the extremely-exposed contractors on average did not.

Figure E.10 shows net operating profits (EBIT) for the four categories from 1981 through 1991. As the chart illustrates, three of the four categories experienced higher earnings in 1991 compared to 1987, while the extremely-exposed contractors showed little earnings growth. (the large variability in earnings for the minimally-exposed contractors is due to the variability in earnings for General Motors. GM accounted for between 45 and 74 percent of the total earnings in this category.) In fact, earnings from 1987 to 1990 steadily decline from \$2.3 billion to \$0.9 billion and recovered in 1991 to slightly above their 1987 level.

According to business articles, trade associations, and briefings before the Commission, changes to federal procurement policies in the mid-1980s affected the profitability of defense contractors. According to Murray Weidenbaum, several changes were made "in the direction of tightening controls over contractors and increasing their costs."²⁷ These changes were:

- Changes in the progress payments rate while interest expense remains unallowable on defense contracts.
- Government share of R&D costs has been reduced.
- Congress, through statute, has emphasized competitive and dual or multiple sourcing.
- Tax benefits associated with government contracting have been reduced.

According to briefings before the Commission, the major change that affected profitability during the late 1980s was fixed price development contracts. In a recent journal article, Jerrold Lundquist states "by instituting the use of fixed-price contracts, which bar contractors from sharing cost overruns with the government, the reforms crimp profits once the government commits to a program."²⁸ He goes on to state "in 1979, only 15% of R&D contracts were offered on a fixed-price basis. By 1984, the number ... doubled to 38%, and by 1988, well over half of all RDT&E contracts were let on a fixed-price basis."²⁹

According to the American Defense Preparedness Association, the effects of fixed-price R&D contracts on defense firms have been an \$8 billion loss over the past three years.³⁰ In briefings and discussions between industry representatives and the Commission staff, representatives stated that research and development contracts are not as profitable as production contracts. If DoD intends to shift a greater portion of the weapons system budget, which includes R&D *and* production, to R&D only, then industry profit margins will fall. While recent initiative by DoD and Congress have limited the use of firm, fixed-price R&D contracts, they are not the only reason for lower financial performance during the late 1980s and early 1990s.

According to Lundquist, poor financial performance during the late 1980s cannot be solely placed on contracting procedures. He argues that contractors' indifference to costs, excessive staffing levels, and

overcapacity are factors as well.³¹ He contends that defense contractors "maintained a huge engineering and manufacturing base that could compete for the next big program."³² DoD paid for this base through contract R&D procurement assignments. In order to win the next program, Lundquist asserts, "contractors bid to levels far below those needed to sustain their high cost structures, giant work forces, and idle factories" and states further that "in nearly every defense segment - fighters, combat vehicles, submarines, electronics, missiles, and shipbuilding - this same unfortunate situation (excess capacity) virtually guarantees that no contractor can sustain profits without a dramatic shake-out."³³ Therefore, excess capacity in the defense industry could be another contributing factor to the weak financial performance during the late 1980s and early 1990s.

In a recent speech before the Aerospace Industries Association, William Anders, Chairman and Chief Executive Officer, General Dynamics Corporation, stated:

Our Defense Industrial Base is already undergoing dramatic changes. Defense spending continues on a sharply downward slope. Workforces are rapidly growing smaller. And, more and more plant and equipment is becoming excess, thereby reducing efficiencies and forcing costs higher.

It is equally critical that we address the massive and growing overcapacity which plagues most sectors of the Defense Industrial Base - especially at the prime supplier level. Whether it is in the private sector or the public sector ..., this overcapacity translates directly into expensive, unproductive overhead and production inefficiencies.³⁴

In testimony before the House Armed Service Committee, Norman Augustine, Chairman and Chief Executive Officer, Martin Marietta Corporation, stated:

The nation's defense industrial base as built-up during the 1980's and highly successful in both hot and cold wars, is today vastly too large to operate efficiently given the projected budget environment. That portion of the defense budget which underpins the defense industrial base has already been reduced by 46 percent ... R&D and procurement accounts combined. As further reductions take place, the over-capacity problem will be exacerbated.³⁵

In order to isolate which of these factors - i.e., progress payments, fixed-price R&D contracts, and excess capacity - was a primary contributor to the industry's weak financial performance, one should undertake detailed financial analysis especially an analysis of basic asset turnover ratios on specific asset categories and cost analysis on individual overhead items. Because of the lack of detailed financial and cost data available on the 25 prime contractors, Commission staff was unable to perform this detailed analysis. Rather, staff utilized briefings and correspondence to the Commission and a review of the literature to determine the specific factors leading to a lower financial performance during the late 1980s and early 1990s.

Findings regarding the financial performance of the 25 prime contractors over the 1981 through 1991 period are:

- The financial performance of the prime defense contractors from 1981 to 1991 period can be divided into two periods: strong during the early and middle 1980s and weak during the late 1980s and early 1990s.
- Weak profitability during the late 1980s and early 1990s was attributed to weak asset utilization by the prime contractors and not to a deterioration in profit margins. This applies to total corporate activity.

The weak utilization is attributed to a faster buildup of assets over sales. Factors contributing to the faster buildup could be the reduction in the progress payments rate and excess capacity. However, the fact that all four categories experienced a decline in the asset turnover ratio, including firms "minimally-exposed" to defense revenues, does not necessarily mean that excess capacity *in the defense industrial base* and the reduction in the progress payment rate are the sole contributors to lower corporate asset performance. Excess capacity, for example, may exist throughout the entire U.S. industrial base including non-defense sectors. The analysis up to this point did not distinguish between assets and sales dedicated to defense and non-defense activities. Rather, total corporate earnings, sales, and assets were used to derive the financial ratios.

- While three of the four categories experienced an *increase* return on sales, or increased profit margins, during the late 1980s and 1990s, contractors "extremely-exposed" to defense sales experienced a *decrease* in return on sales thereby exacerbating their weak financial performance.

This result is attributed to poor earnings performance between 1987 and 1991. Since examining total corporate earnings does not distinguish between defense and non-defense earnings, it is premature to conclude that fixed-price development contracts are the main reason for lower profits during this period. The analysis of the aerospace/defense sector in the next section will discuss the issue of asset utilization and earnings performance for the defense segments of this industry. This analysis provides an additional understanding of the financial performance of the defense industry.

THE FINANCIAL PERFORMANCE OF THE AEROSPACE/DEFENSE INDUSTRY

The analysis examines the financial performance of the ten companies that comprise the Standard & Poor's Aerospace/Defense composite. The same measures are employed - return on sales, asset turnover ratio, and return on assets - as done for the top 25 prime contractors. Each company in the aerospace composite is also one of the top 25 prime contractors.

The 1980s was a vibrant period for the aerospace/defense sector. The industry saw unprecedented levels of spending for both military and commercial aircraft. Record backlog yielded strong sales and cash flow. Projections for future cash flow were sufficient for companies to obtain the debt needed to finance the backlog.³⁶

The financial performance of the aerospace/defense industry is divided into two periods - 1981-1987 and 1987-1991. These periods reflect the changes in defense spending over the ten-year period. Between 1981 and 1987 total defense spending increased dramatically due to the Reagan buildup. As Table E.5 shows, total defense outlays during this period increased on average 9.8 percent annually in current dollars. During the same period, outlays for procurement of goods and services increased an average of over 15.1 percent annually in current dollars.

The annual compound growth rate in sales for the aerospace/defense industry from defense activities closely matched the growth rate in DoD procurement. Corporate revenues from defense businesses increased on average 13.8 percent annually - 5 percentage points greater than the growth rate in total corporate sales.

TABLE E.5

Annual Compound Growth Rates in DoD Outlays
and Aerospace/Defense Sales (Current Dollars)

	DoD Outlays ^a	Aerospace/Defense Sales ^b		
	Total	Procurement	Corporate	Defense
1981-1987	9.8%	15.1%	8.7%	13.8%
1987-1991	-1.1%	0.4%	5.4%	0.4%

NOTES: a. Growth rates pertain to fiscal years.
b. Growth rates pertain to calendar years.

However, between FY1987 and FY1991, total defense spending and outlays for procurement exhibited a different trend. Total defense outlays declined on average by more than one percent per year in current dollars, while total procurement increased on average a modest 0.4 percent per year. While total procurement growth during the late 1980s experienced modest growth, defense sales also grew at the same average annual rate of 0.4 percent. How these changes in defense spending affect the financial performance of the aerospace/defense industry, we explore next.

The financial ratios of the aerospace/defense companies reveal that overall corporate profitability experienced dramatic changes during the 1980s and early 1990s. As Figures E.11 and E.12 show, both the corporation and the defense-related segments experienced strong profitability. Overall corporate ROA averaged 12.2 percent while the defense business averaged a strong 19.6 percent. On average, the aerospace/defense sector outperformed the top 25 contractor composite in terms of profitability - 12.2 percent versus 11.1 percent respectively (see Figure E.3.) Comparisons must be treated with caution because progress payments are a contra asset account and are subtracted from defense assets.

The strong financial performance in defense units of the aerospace industry is attributed to high asset utilization and profit margins. As shown in Figure E.12, the high asset turnover ratio of 2.364 for defense means that every dollar of "defense" assets generated over \$2.36 in defense sales. This is much higher than the corporate rate of \$1.73-\$1.74 in sales (Figure E.11) and much higher than the corporate rate of \$1.32 for the top 25 prime contractors (Figure E.3). During the early and middle 1980s,

defense assets made a strong contribution to corporate revenues. These assets produced a higher rate of sales than non-defense assets. However, this strong performance did not last through the rest of the 1980s.

Between 1987 and 1991, there was a much different financial performance. Average total corporate return on assets decreased dramatically from 12.2 percent to 9.9 percent. The defense segment contributed significantly to this decline. Average return on assets decreased by half from 19.6 percent to slightly less than ten percent - drop of almost 10 percentage points. Two factors contributed to this decline - a significant decline in the average asset turnover ratio and in the average profit margin. What financial variables contributed to the decline in these ratios is discussed next.

The analysis of the financial ratios will examine the three variables that are used to derive the asset turnover ratio and the profit margin - sales, assets, and earnings. These variables are analyzed from three perspectives: the total corporation, non-defense activities, and defense activities. The analysis begins with sales.

Figure E.13 presents sales data, in current dollars, for the corporation divided into non-defense and defense segments. Total corporate sales doubled from \$61.0 billion in 1981 to \$124.2 billion by 1991. However, the growth in total sales showed two different patterns. Total corporate sales increased on average 8.7 percent per year from 1981 to 1987 but increased on average only 5.4 percent per year between 1987 and 1991. While sales continued to grow during the late 1980s and early 1990s, the pace was much slower.

By separating sales into non-defense and defense, a better understanding of the industry's sales performance is provided. Figure E.13 is a picture of contrasts. Between 1981 and 1987, defense sales increased at an average annual rate of 13.8 percent clearly outpacing non-defense sales which increased on average 3.1 percent per year. During this period, the ratio of defense to non-defense sales increased dramatically from 0.86 in 1981 to 1.55 in 1987. Defense sales became the majority source of sales revenues in the aerospace industry. Overall defense sales accounted for an average 57.4 percent of total corporate sales during this period. However, this relationship began to change by 1987.

While the growth in corporate sales decreased on average to 5.25 percent, sales from defense operations increased very little between 1987 and 1991 growing on average less than one percent per year. This meager

growth is a reflection of the reduction in DoD procurement outlays between 1987 and 1991. While growth in defense sales made a significant contribution to overall corporate sales in the early and mid-1980s, they have remained fairly constant since 1987 averaging approximately \$62.2 billion per year. However, sales from non-defense markets picked up dramatically and increased on average almost 12 percent per year.

The double-digit growth in non-defense sales helped offset the meager growth in defense sales. Although defense sales still represented a majority of total corporate revenues - 55.2 percent on average, the ratio of defense to non-defense sales began to decline dramatically from 1.55 in 1987 to 1.01 by 1991. While non-defense sales helped offset this decline, they did not replace dollar-for-dollar defense sales as the major source of corporate income.

A decline in sales does not always mean a decline in profitability. If changes in costs and assets reflect the changes in sales, profitability may not be affected. That is, if a decline in sales as experienced by the defense aerospace sector is matched by a similar decline in costs, both direct and indirect, and in assets, profitability will remain unaffected. However, this was not the case with the defense aerospace industry. In fact both asset utilization and profit margins declined from the early and middle 1980s to the late 1980s. To explain the decline in asset utilization, asset data was examined over the 1981 to 1991 period and then the earnings performance of the defense and non-defense activities.

As stated in the analysis of the 25 prime contractors, a long term decline in the asset turnover ratio means excess capacity. For the aerospace industry, and the defense segments in particular, assets grew at a faster rate than sales during the 1980s. Hence, the decline in the asset turnover ratio is attributed to this fact. Figure E.14 shows that total corporate assets grew on average 10.3 percent per year between 1981 and 1987 or *1.18 times the average growth in sales*. During the late 1980s and early 1990s, total corporate assets grew on average only 6.6 percent per year yet *1.22 times sales*. Although the rate of increase in assets declined during the late 1980s, they still outpaced the growth in sales by an even larger margin. This higher growth in assets over sales led to a decline in the average asset turnover ratio from 1.735 to 1.519. However, the turnover ratio experienced two different patterns during the 1980s.

Returning to Figure E.11 shows that the asset turnover ratio for the aerospace industry increased slightly during the early 1980s, save 1982, but began to decline steadily beginning in 1985 and continuing into the

1990s. As stated previously, a steady long-term decline in the ratio suggests excess capacity in the industry. The decline in the turnover ratio strongly suggests excess capacity developing in the aerospace/defense industry. The large decline from 1986 to 1988 also suggests that a change in the progress payment rate during this period may have had an effect.

Figure E.14 shows defense and non-defense assets for the aerospace industry from 1981 to 1991. The change in assets between defense and non-defense shows the same pattern shown by defense and non-defense sales. Defense-related assets grew at an average annual rate of almost 16.5 percent between 1981 and 1987, while non-defense-related assets grew at an average annual rate of 6.0 percent. *During this period, defense-related assets grew 1.2 times faster than defense-related sales.*

Beginning in 1987 the rapid buildup of defense-related assets began to wane. Faced with lower sales growth, the average annual rate of growth declined to 3.2 percent compared to an increase in non-defense-related assets from almost six percent to 9.6 percent. However, defense-related assets continued to outpace sales growth by almost nine times. With a slowdown in defense sales during the late 1980s and early 1990s, this buildup in defense assets contributed to the underutilization of assets as reflected in the dramatic decline in the asset turnover ratio for defense-related assets since 1987.

Figures E.11 and E.12 present average asset turnover ratios for the total corporation and the defense segments, respectively. Average asset turnover for the total corporation declined from 1.735 between 1981-87 to 1.519 between 1987-91. Although the average asset turnover for the defense segments showed a more dramatic decline - 2.364 to 1.787, defense-related assets still made a larger contribution to corporate sales than non-defense related assets.

The growth in non-defense assets exhibited two different patterns. In the early and middle 1980s, non-defense assets grew at an average annual rate of 3.2 percent - almost twice the rate of sales growth. However, total assets during the late 1980s and early 1990s grew at an average annual rate of 9.6 percent but less than the rate of sales growth. However, with the rapid growth in assets during the late 1980s, sales kept growing at a much higher pace thereby enabling the average asset turnover ratios to remain fairly constant during these two periods - an average of 1.287 between 1981-1987 and an average of 1.275 between 1987-1991.

In the previous discussion of the financial performance of the 25 prime contractors, changes in the progress payment rate may have had an effect on the turnover ratio. While only total assets were analyzed, the turnover ratio presented in Figure E.12 may provide clues to the effect changes in progress payments had on asset utilization. In August 1981, the progress payment rate was increased from 85 percent to 90 percent for large companies. From 1981 until 1984, the asset turnover ratio increased from 2.34 to 2.64. This suggests that lowering the progress payment rate may have increased the performance of defense assets reflected in the increased in the asset turnover ratio.

In May 1985, DoD lowered the progress payment rate from 90 percent to 80 percent, and in October 1986, DoD lowered it again to 75 percent. During the 1984 and 1988 period, the turnover ratio declined dramatically from 2.64 to 1.83. Therefore, the lowering of the progress payment rate may have decreased the performance of assets. Clearly, an argument can be made that the changes in the progress payment rates during the 1980s affected asset utilization and hence profitability. However, since 1988 a different relationship between the change in the progress payment rate and the asset turnover ratio developed.

The progress payment rate was increased in 1988 and again in 1991, yet the turnover ratio continued to decline. The rate was increased to 80 percent in October 1988 and to 85 percent in July 1991. From 1988 until 1991, the turnover ratio declined from 1.83 to 1.68. It is difficult to conclude that the change in the progress payment *alone* contributed to the overall decline in asset utilization. As stated previously, the progress payment rate applies to new contracts and may not have an effect on assets for a number of years. What may be another contributing factor is excess capacity. While the decline in profitability in the aerospace industry can be attributed to the decline in the utilization of defense assets, it's not the only reason. The decline in the profit margin also contributed to the overall decline in profitability.

Figure E.15 presents total corporate earnings by defense and non-defense activities. There are two salient features are illustrated in this chart. First, both defense and non-defense activities made positive contribution to earnings growth during the early and middle 1980s. Defense earnings were the stronger performer, increasing at an annual average rate of over 10 percent compared to the 2.7 percent for the non-defense business.

However, the profit performance for the corporations changed by 1987. Between 1987 and 1990, industry operating profits remained constant. This lack of growth in total corporate earnings is directly attributed to the dramatic decline in defense profits. In fact, defense profits decline at an annual rate of over two percent while non-defense profits increased on average almost 18 percent per year. This rapid increase in non-defense earnings helped but did not totally offset the decline in defense earnings. Figure E.15 also shows, defense earnings began their decline *as early as 1986.*

In the previous section, the effect fixed-price R&D contracts may have had on earnings was mentioned. In fact, it was during this period that the percentage of fixed-price contracts increased. Industry representatives as well as journal articles suggest that the decline in the earnings is attributed to fixed-price development contracts. Certainly, earnings performance since 1985 suggest the effects of fixed-price development contracts. But it was also suggested in the previous section that poor earnings performance may be attributed to the contractors' indifference to costs and excessive staffing levels.

Findings regarding the financial performance of the aerospace/defense composite are similar to the findings for the 25 prime contractors:

- Profitability during the 1980s and early 1990s experienced two different patterns - strong profitability in the early and middle 1980s due to strong profit margins and high asset turnover ratios and lower profitability in the late 1980s and early 1990s due to lower profit margins and declining turnover ratios.
- A declining asset turnover ratio for defense assets can be attributed to excess capacity as well a changing progress payment rates throughout the 1980s.
- Declining profit margins due to poor earnings performance during the late 1980s.

Will the prime contractors continue to see a weak financial performance during the 1990s or will they make adjustments to the drawdown? This is the next issue.

FINANCIAL OUTLOOK FOR THE TOP PRIME CONTRACTORS

Up to now, the past and present financial performance of the top prime contractors were examined. Now, the future is examined. However, unlike the previous analysis, strategies defense firms may undertake to adjust to the defense drawdown will be discussed. A quick overview of these strategies will be presented and an analysis of the future financial performance of the prime contractors including the aerospace/defense companies will follow.

At the request of the Commission, DRI analyzed the impact the drawdown will have on the top 25 prime contractors. DRI's report discusses at length the various strategies contractors may undertake as a result of the drawdown. This section briefly highlights the conclusions in the DRI report and presents projected corporate financial data drawn from the report.

According to the DRI report, the prime contractors "will successfully manage the decline in defense spending and sustain the financial conditions necessary for a strong industrial base."³⁷ DRI concludes, "there will be major consolidation as firms focus on their defense segments, try to merge with or acquire similar business units, reduce duplicate costs, and improve operating results."³⁸ How companies will adjust to the downsizing in defense and the financial outlook is the purpose of this section.

Defense contractors view the decline in defense spending as permanent not cyclical. This view of the defense market will require firms to undertake different strategies based on their "exposure" to defense revenues. In the short-term, DRI concludes that the prime contractors will "focus on the bottom line, manage for cash, cut costs, reduce payrolls, defer capital spending, slash internally funded R&D, sell non-core businesses, and reduce debt."³⁹ Essentially, the strategy for the prime contractors is to focus on profitability not growth by *improving profit margins* (cut costs, reduce payrolls, slash R&D) and by *reducing excess capacity* (sell non-core businesses, defer capital spending).

In order to improve financial performance, DRI lists three primary options contractors have pursued or will pursue either independently or in combination. They are (1) aggressive divesting of individual business segments; (2) focus on core businesses or competencies and manage the corporation for cash and profitability; or (3) pursue and expand commercial markets and foreign sales. Regardless of which strategy is pursued, contractors will manage for profitability and not growth. The operative

word is *consolidating* defense segments by cutting investment spending and R&D, improving profit margins, selling unprofitable segments, or merging or acquiring segments to obtain a dominant share of the defense market or sector.

According to Jerrold Lundquist, "the triple shock, aggravated by fixed-price contracts, competitive bidding, and excess capacity, means that defense companies are faced with extreme measures to stay profitable. The old survival strategies of commercialization, diversification, and globalization hold little promise."⁴⁰ He continues to say that these conventional solutions won't work. "To survive, ..., in this hostile environment, to carry a positive margin and reach a profitable end state," he argues "contractors have to make cuts that outpace declining revenues. Instead of growing faster than their industry is growing, they have to shrink faster than their industry is shrinking."⁴¹ Shrinking means "owning up to massive overcapacity, overstaffing, and inefficiency."⁴²

According to a study by Booz-Allen & Hamilton, "the global aerospace industry is maturing overall and will enter a period of significant consolidation in the 1990s, just as the 1980s witnessed tremendous consolidation in ... petroleum, broadcasting, and consumer products."⁴³ They also suggest that "most participants in the worldwide aerospace/defense industry generally acknowledge the emergence of structural changes driven by fewer programs, declining markets and intensifying global competition."⁴⁴

Today a dozen defense companies compete in six or more market segments, according to Lundquist, by tomorrow, "they will compete in 2 or 3."⁴⁵ In 1992, there are 13 companies in the space segment, and 16 compete for in the avionics business. By 1997, he forecasts there will be only five or six in each groups. By 1997, he also forecasts 5 prime contractors in the fighter aircraft and helicopter market. The goal of the defense contractors "is to structure the company's core business to gain preeminence in their segments. This requires ... a company's ability to balance excess capacity with future demand."⁴⁶ What is the outlook in terms of the contractor's financial performance over the decade?

Figures E.16 through E.20 present historical and projected data on total corporate profitability for the top 25 prime contractors, extremely-exposed contractors, highly-exposed contractors, moderately-exposed contractors, and aerospace/defense contractors, respectively. The projections are based on data provided in the DRI study. Projected balance sheet data for the minimally-exposed contractors were not available.

For the top prime contractors, average profitability as measured by return on assets is lower in the 1991-2000 period than for the other two periods analyzed. This decline is attributed to a continuing decline in the asset turnover ratios rather than to profit margins. As Figure E.16 shows, average profit margin for the 1991-2000 period outperforms the 1981-1987 and 1987-1991 periods. In fact, the average return on sales for each of three "defense-exposure" categories is greater than the average return on sales for the 1981-1987 and 1987-1991 periods. Hence, if the contractors pursue the strategies outlined by DRI, profit margins will improve dramatically throughout the 1990s. However, this optimism is tempered by the continuing problem with asset utilization.

As the charts illustrate, the average asset turnover ratio for all five groups of contractors will continue to decline albeit at a slower pace. The average turnover ratio for the top 25 prime contractors will decline to 0.7113 during the 1990s with the "moderately-exposed" contractor experiencing the largest decline. These projections strongly suggest that excess capacity may continue to be a problem throughout the 1990s. Whether or not this excess is attributed to defense assets or non-defense assets cannot be determined because the projections pertain to the total corporation. The continuation of low asset turnover ratios will continue to put a strain on profitability.

While the average return on assets will decline in the 1990s, this decline does not apply to all groups of contractors. Average profitability for the "extremely-exposed" contractors will *increase* during the 1990s compared to the late 1980s and early 1990s. This performance is attributed to stronger average profit margins and a modest decline in the asset turnover ratio (Figure E.17). While earnings are projected to grow on average at less than one percent per year, the average growth in assets will outpace the average growth in sales by 1.2 times between 1992 and 2000.

According to DRI, all the companies in this category, except General Dynamics, will pursue a consolidation strategy. This strategy "will likely result in a smaller, less competitive mix of 'dedicated' defense contractors-fewer missile manufacturers, fewer airframe manufacturers, and fewer ship builders."⁴⁷

The "highly-exposed" contractors, whose revenues from defense-related activities comprise between 30 and 70 percent of the total revenues, are better able to alleviate the impacts of reduced defense spending. Their strategy is either to solidify key defense markets, use the defense backlog

to generate funds for non-defense investment, or sell defense-related businesses.⁴⁸

Whatever strategy these firms undertake, their financial profitability is projected to be lower during the 1990s than during the 1980s. As Figure E.18 shows, average return on assets is projected to be lower during the 1991-2000 period than during the previous two periods. Although profit margins will be higher, the problem remains with asset utilization. The ratio is expected to decline to an average of less than 1.000, lower than the averages for the previous periods. While the firms in this category will on average expect to see better profit margins, earnings are expected to grow on average 1.84 percent per year, excess capacity is likely to remain a draw on profitability as assets are expected to outpace sales on an average annual rate of 2.4 times.

"Moderately-exposed" contractors are firms with defense-related revenues comprising between 15-30 percent of total corporate revenues. Hence, their non-defense work is the primary focus of their business. According to DRI, these companies will be inclined to operate their defense businesses either through acquisitions or liquidation.⁴⁹ DRI contends that this category of prime contractors will be less "financially threatened by lower defense spending."

Examining the projected financial performance of these companies reveals a familiar trend - significantly improve profit margins but decreasing asset utilization through much lower asset turnover ratio (Figure E.19). The average asset turnover ratio in this category is dominated by the declining ratio for General Electric. If GE were excluded, then the average asset turnover ratio would in fact *increase*.

The aerospace/defense industry reveals a different pattern. In fact, profitability on average is expected to increase over the 1987-1991 period but remain below the 1981-1987 average (Figure E.20). Improvement to the average profit margins will compensate for the continuing decline in the asset turnover ratio.

The major findings in terms of the financial outlook for the defense contractors are:

- Profit margins on average are projected to continue to improve throughout the 1990s.

- Underutilization of assets may still occur because asset turnover ratios on average continue to decline thereby offsetting improvements in profit margins.
- Profitability on average is expected to be slightly lower during the 1990s, but due to higher profit margins, the firms are not at financial risk.

ENDNOTES FOR ANNEX E

1. Data Resources, Inc./McGraw-Hill, "The Impact of Reduced Spending on U.S. Defense Contractors," (February 1993) 1.
2. Jerrold Lundquist, "Shrinking Fast and Smart," Harvard Business Review (November-December 1992) 80-81.
3. Booz-Allen & Hamilton, "Consolidation in Aerospace/Defense: What's Next -A Viewpoint by Martin J. Bollinger and John R. Harbison," (1992) 2.
4. U.S. Department of Defense, "Report to Congress on the Defense Industrial Base", (Washington, D.C.: 1991) ES-1.
5. U.S. Department of Commerce, "Industrial Output and Employment Effects of Planned Cuts in Defense Spending, 1991-1996", June 1992.
6. Jacques Gansler Affording Defense (Cambridge, MA: The MIT Press, 1991) 257.
7. John Alic et. al., Beyond Spinoff: Military and Commercial Technologies in a Changing World (Boston, MA: Harvard Business School Press, 1992) 165.
8. Murray Weidenbaum, Small Wars, Big Defense: Paying for the Military After the Cold War (New York, NY: Oxford University Press, 1992) 143.
9. U.S. Department of Defense, "Defense Financial and Investment Review" (June 1985) III-1.
10. Ibid.
11. Ibid., IV-1.

12. This paragraph and those that follow in this section draw from three reports: U.S. Department of Defense, Industrial College of the Armed Forces, "Defense Industry Studies," (Academic Year 1990-1991); U.S. Department of Commerce, U.S. Industrial Outlook 1993 (Washington, D.C.: U.S. Government Printing Office, 1993); U.S. Department of Defense, "Report to Congress on the Defense Industrial Base," (Washington, D.C.: 1991).
13. U.S. Department of Defense, Industrial College of the Armed Forces, "Defense Industry Studies," (Academic Year 1990-1991) 8-7.
14. Ibid.
15. American Defense Preparedness Association, "Seminar Series on U.S. Defense Industrial Base Preparedness," (Arlington, VA: 1992) 22.
16. U.S. Department of Defense, "Report to Congress on the Defense Industrial Base," (Washington, D.C.: 1991) 3-15.
17. U.S. Department of Commerce, U.S. Industrial Outlook 1993 (Washington, D.C.: U.S. Government Printing Office, 1993) 20-11.
18. Data Resources, Inc./McGraw-Hill, "The Impact of Reduced Defense Spending on U.S. Defense Contractors," 17-18.
19. Erich A. Helfert, Techniques of Financial Analysis, 6th ed. (Homewood, IL.: Richard D. Irwin, Inc., 1987) 21-44.
20. James C. Van Horne, Financial Management and Policy, 7th ed. (Englewood Cliffs, N.J.: Prentice-Hall, 1986) 781.
21. L. C. Gupta, Financial Ratios for Monitoring Corporate Sickness: Towards a More Systematic Approach (Oxford: Oxford University Press, 1983) 36.
22. Leopold A. Bernstein, Analysis of Financial Statements (Homewood, IL.: Richard D. Irwin, Inc., 1990) 203.
23. Data Resources, Inc./McGraw-Hill, "The Impact of Reduced Defense Spending on U.S. Defense Contractors," 7-8.
24. Leopold A. Bernstein, Analysis of Financial Statements 207.

25. Ibid., 203.
26. L.C. Gupta, Financial Ratios for Monitoring Corporate Sickness 36.
27. Murray Weidenbaum, Business, Government, and the Public, 4th ed. (Englewood Cliffs, N.J.: Prentice-Hall, 1990) 365-366.
28. Jerrold Lundquist, "Shrinking Fast and Smart," 78.
29. Ibid., 79.
30. American Defense Preparedness Association, "Seminar Series on U.S. Defense Industrial Base Preparedness," 29.
31. Jerrold Lundquist, "Shrinking Fast and Smart," 79.
32. Ibid.
33. Ibid., 79-80.
34. William A. Anders, "Revisiting the Rationalization of America's Defense Industrial Base: Ensuring Public and Private Sector Efficiency and Adequacy for Future National Security" Speech before the Human Resources Council, Aerospace Industries Association, October 27, 1992.
35. Norman R. Augustine, Testimony before the Committee on the Armed Services, United States House of Representatives, Washington, D.C., April 30, 1992.
36. Barbara Bruser, "Financing Aerospace and Defense Companies: How Lenders Use Financial Statements," (Bruser & Company, Los Angeles, CA.) 1.
37. Data Resources Inc./McGraw-Hill, "The Impact of Reduced Spending on U.S. Defense Contractors," 1.
38. Ibid.
39. Ibid.
40. Jerrold Lundquist, "Shrinking Fast and Smart," 80.

41. Ibid., 80-81.
42. Ibid., 81.
43. Booz-Allen & Hamilton, "Consolidation in Aerospace/Defense: What's Next?" 2.
44. Ibid.
45. Jerrold Lundquist, "Shrinking Fast and Smart," 81.
46. Ibid., 81-82.
47. Data Resources Inc./McGraw-Hill, "The Impact of Reduced Defense Spending on U.S. Defense Contractors," 9.
48. Ibid., 10.
49. Ibid., 11.

APPENDIX

FIGURES E.1 THROUGH E.20

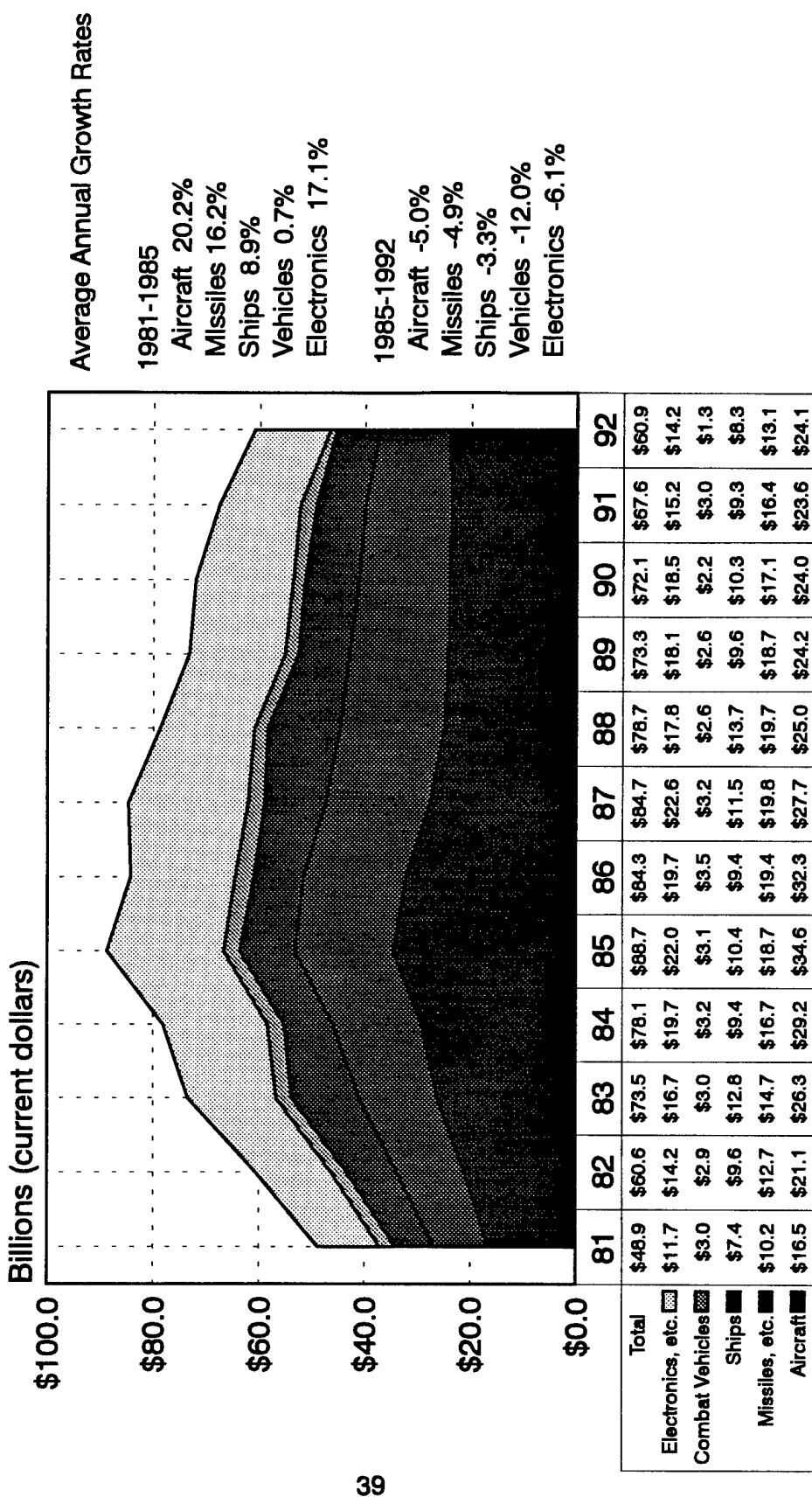
AND

TABLES E.1 THROUGH E.4

FIGURE E.1

PROCUREMENT AWARDS BY PROGRAM

FY1981 - FY1992



SOURCE: Directorate for Information Operations and Reports, DoD

FIGURE E.2
PROCUREMENT AWARDS BY PROGRAM

FY1981 - FY1992

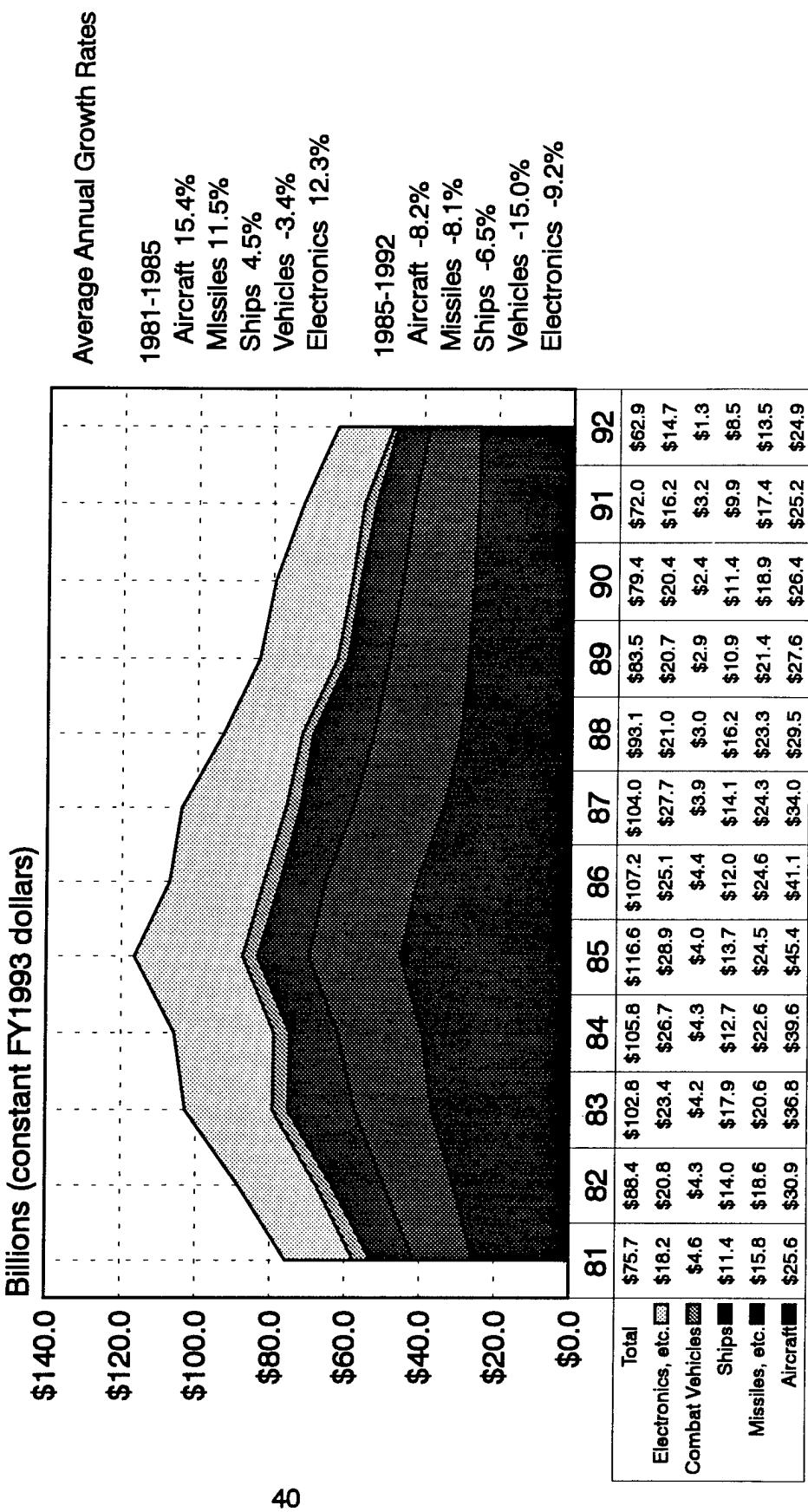


FIGURE E.3
TOP DoD PRIME CONTRACTORS
TOTAL CORPORATE PROFITABILITY

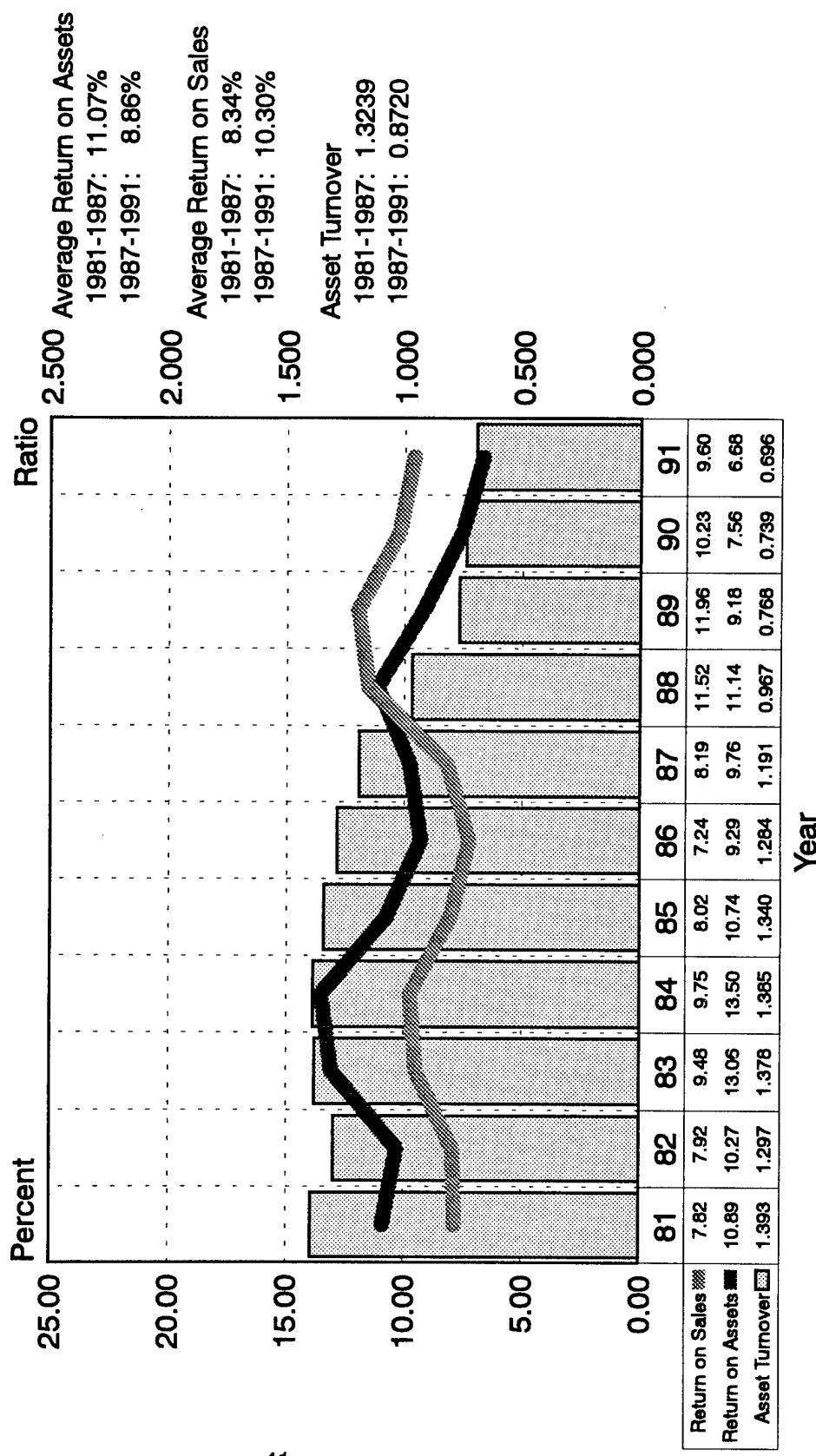
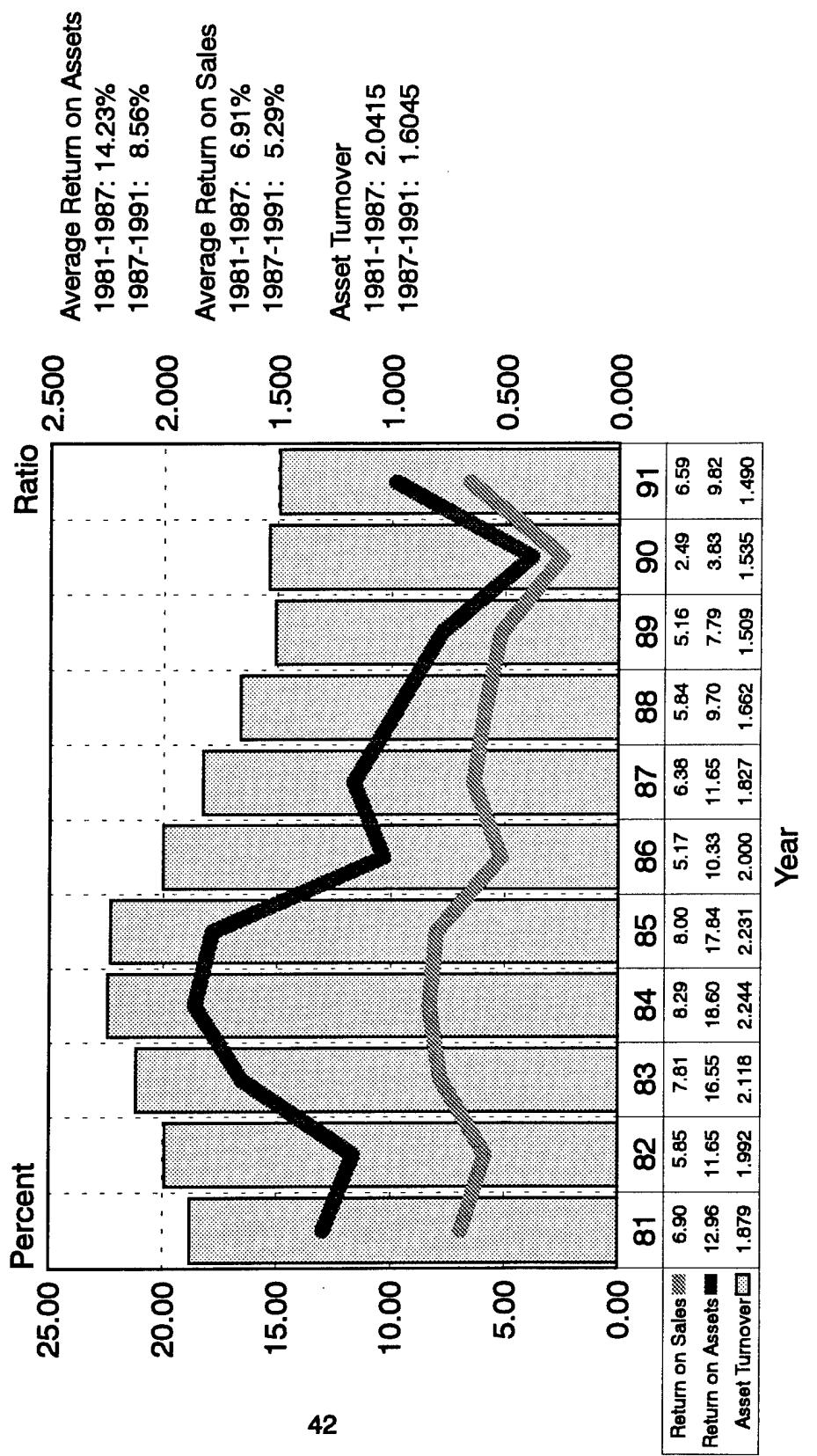


FIGURE E.4

EXTREMELY EXPOSED PRIME CONTRACTORS
TOTAL CORPORATE PROFITABILITY



SOURCE: S&P Stock Reports and DRI/McGraw Hill

FIGURE E.5
HIGHLY EXPOSED PRIME CONTRACTORS
TOTAL CORPORATE PROFITABILITY

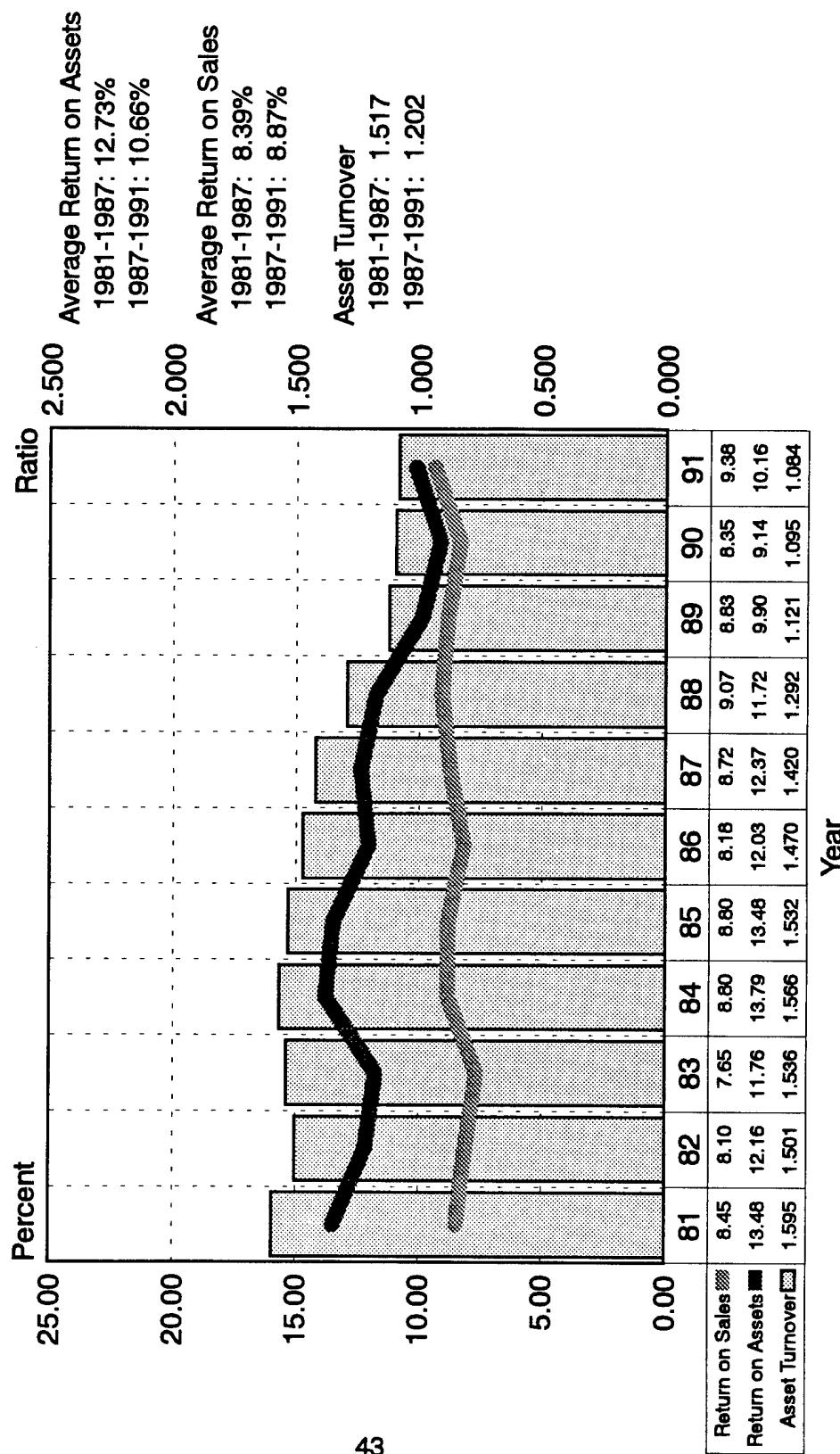


FIGURE E.6
MODERATELY EXPOSED PRIME CONTRACTORS
TOTAL CORPORATE PROFITABILITY

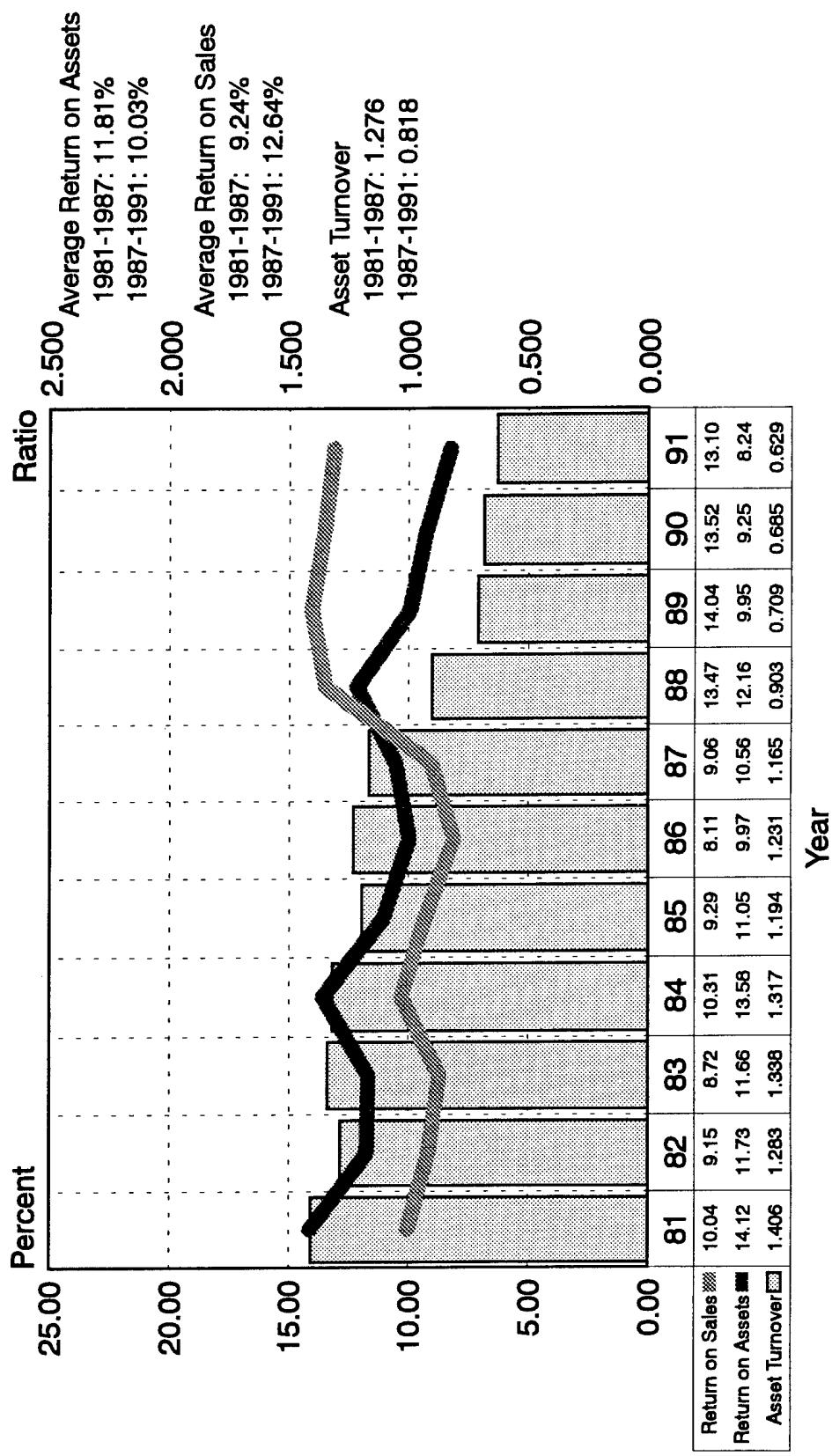


FIGURE E.7
MINIMALLY EXPOSED PRIME CONTRACTORS
TOTAL CORPORATE PROFITABILITY

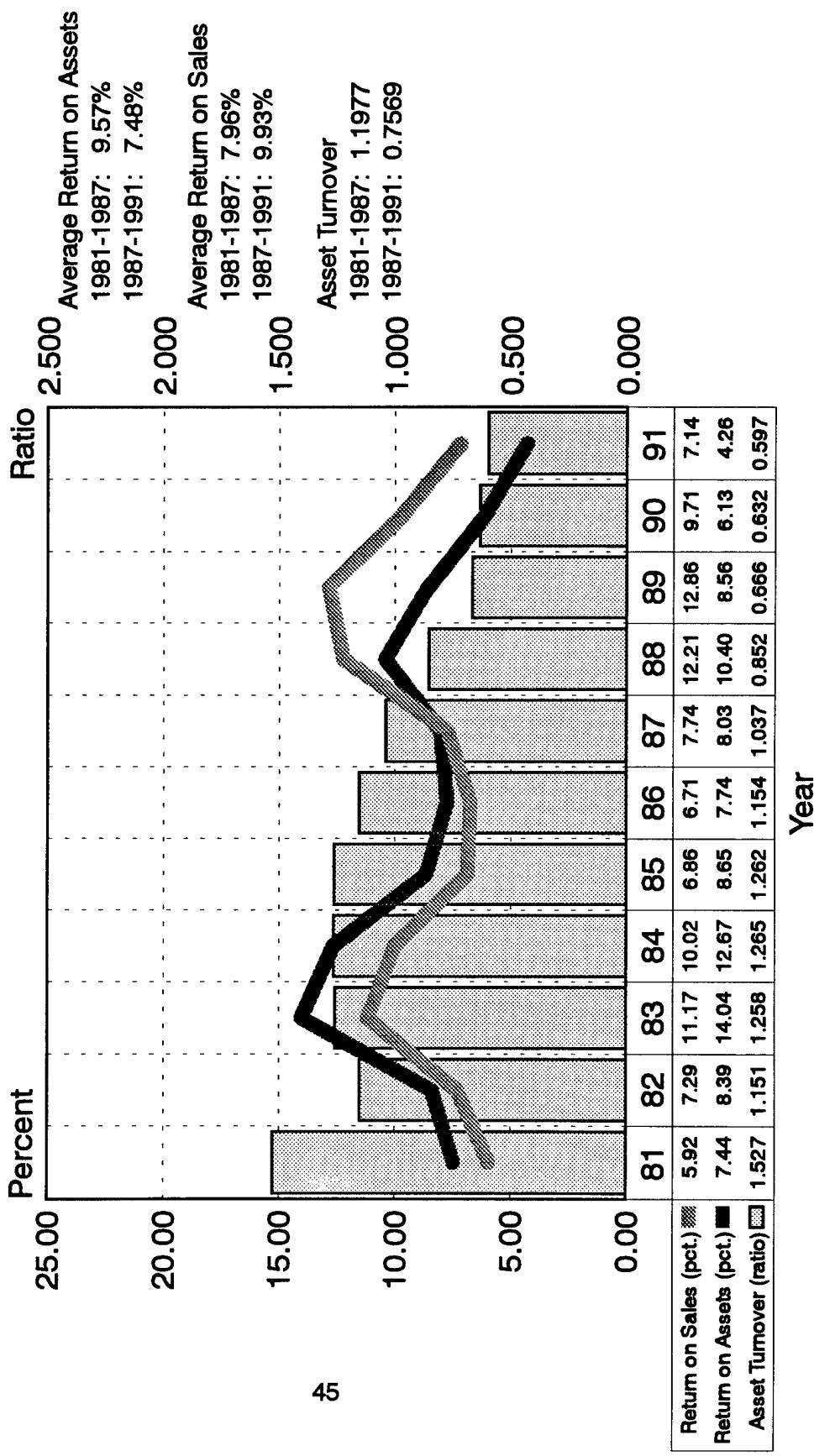
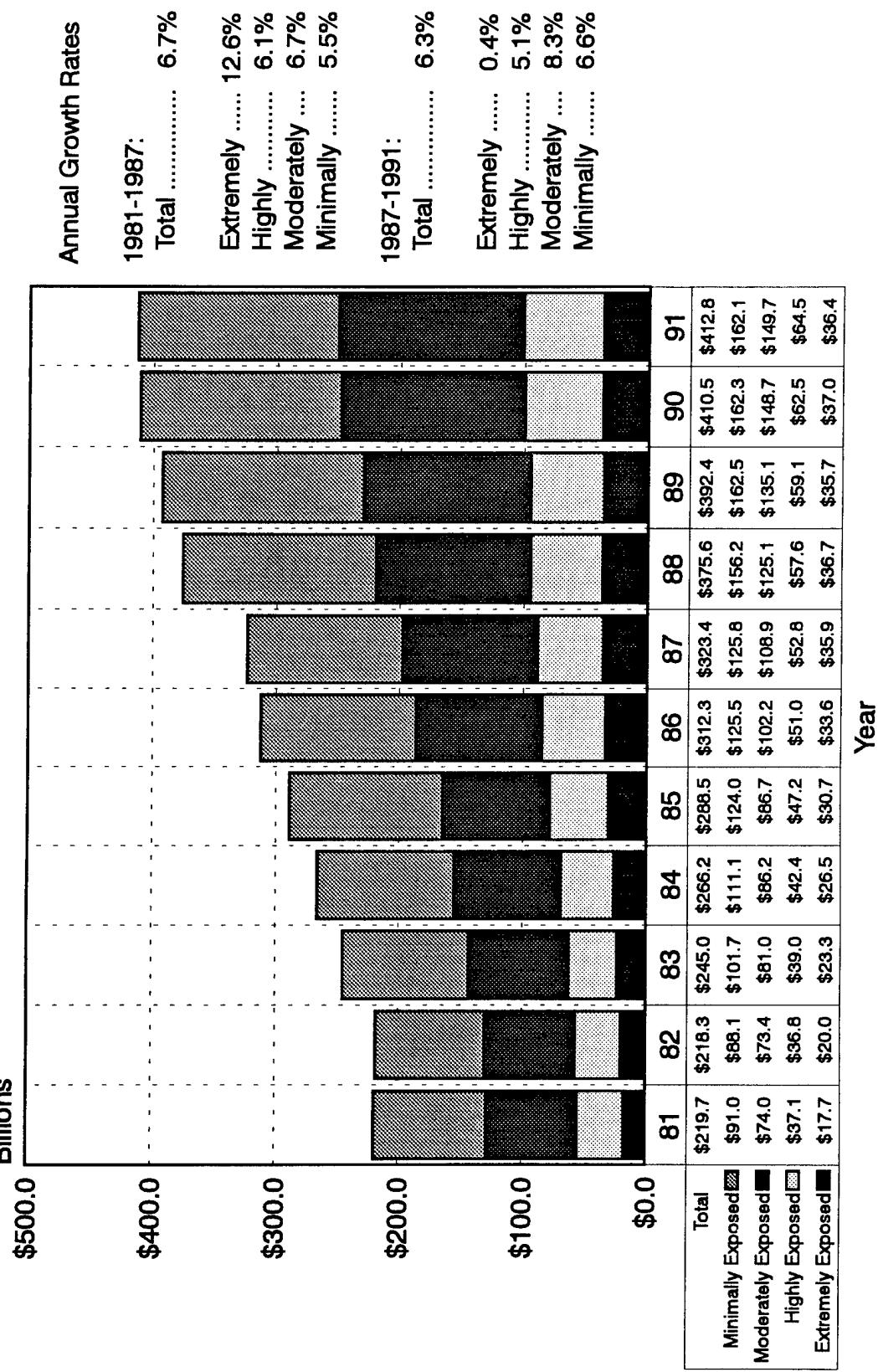
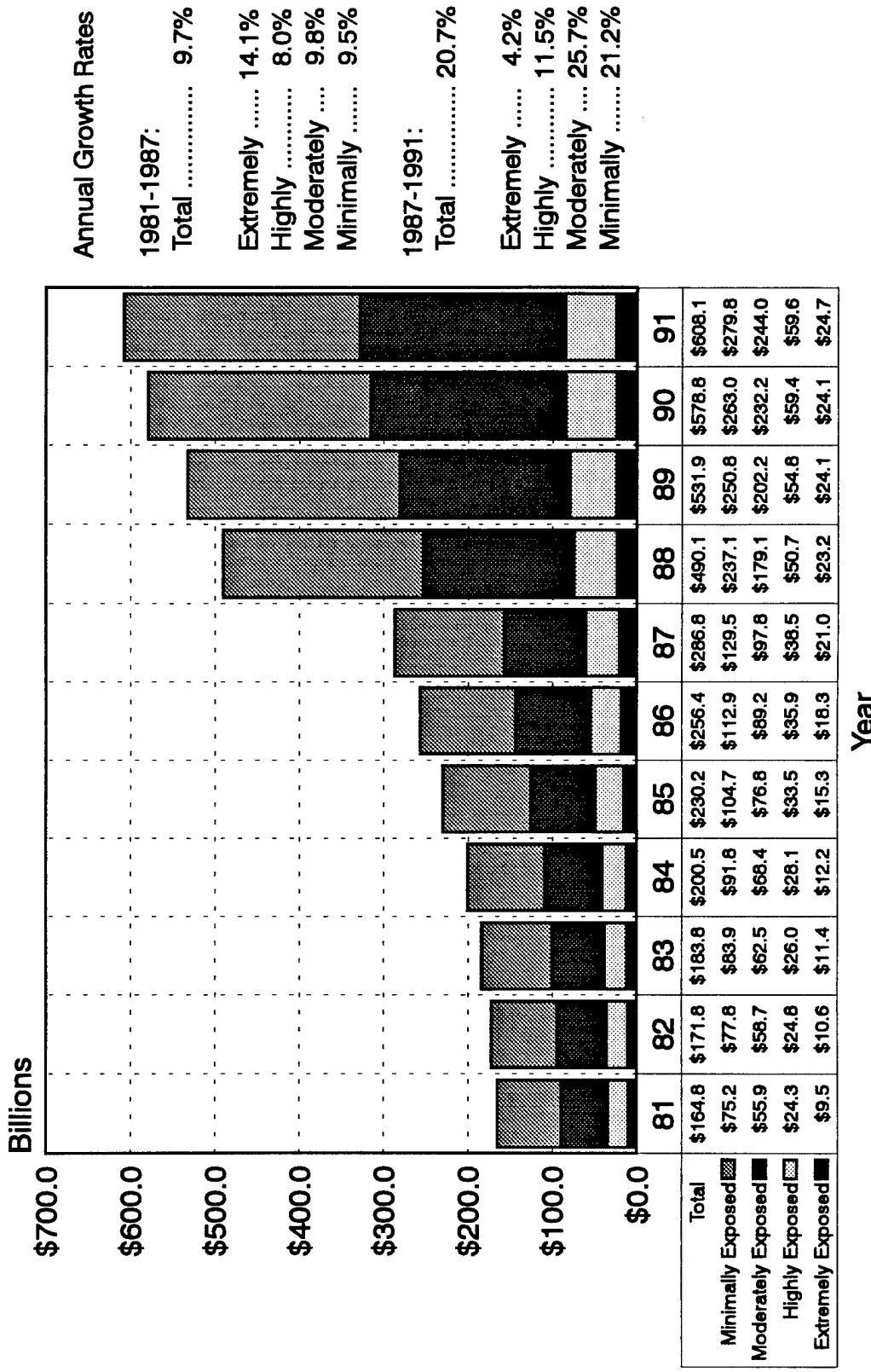


FIGURE E.8
TOP DoD PRIME CONTRACTORS
TOTAL CORPORATE SALES



SOURCE: S&P Stock Reports

FIGURE E.9
TOP DOD PRIME CONTRACTORS
TOTAL CORPORATE ASSETS



SOURCE: S&P Stock Reports and DRI/McGraw-Hill

FIGURE E.10
TOP DoD PRIME CONTRACTORS
 TOTAL CORPORATE PROFITS

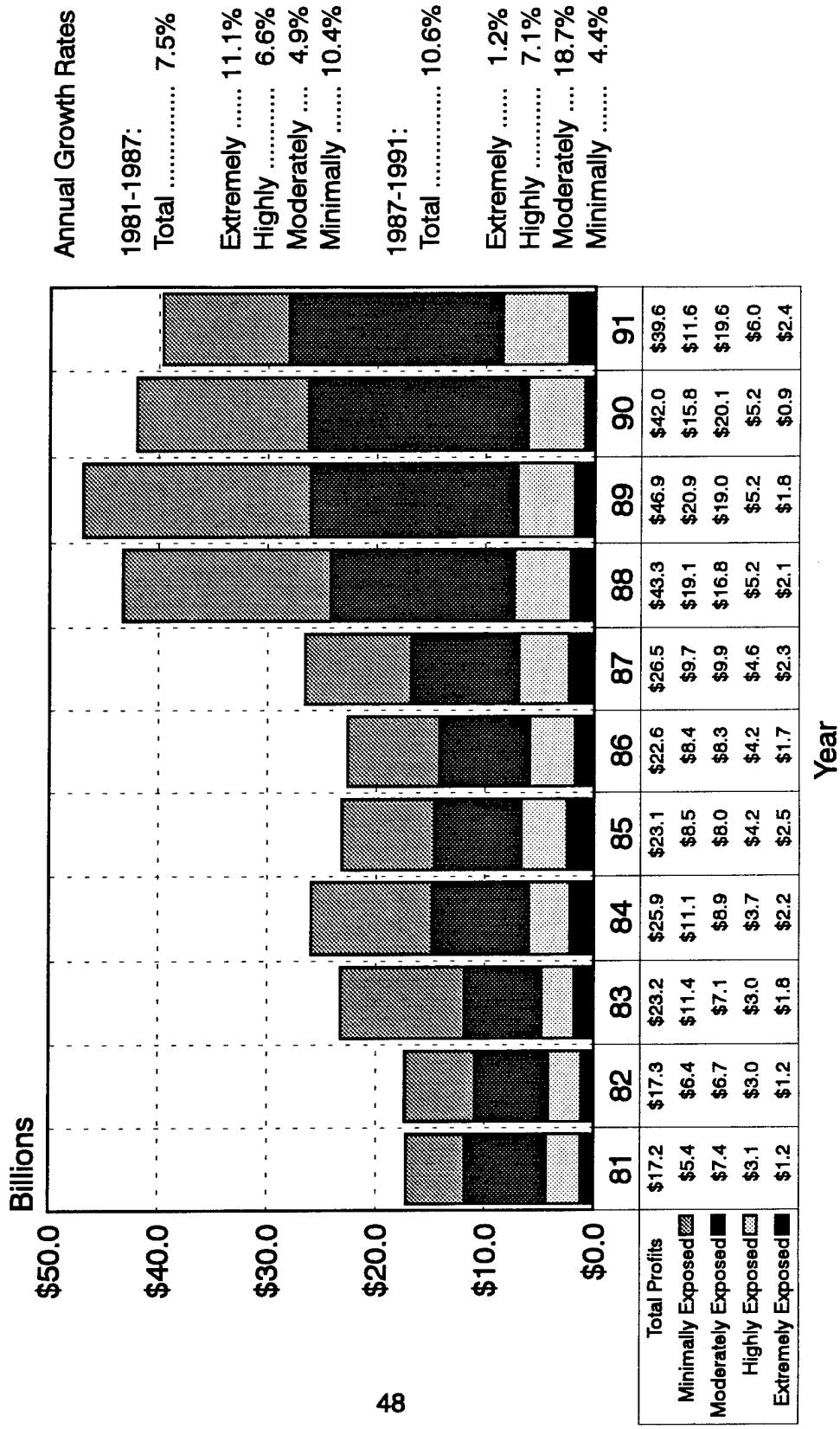
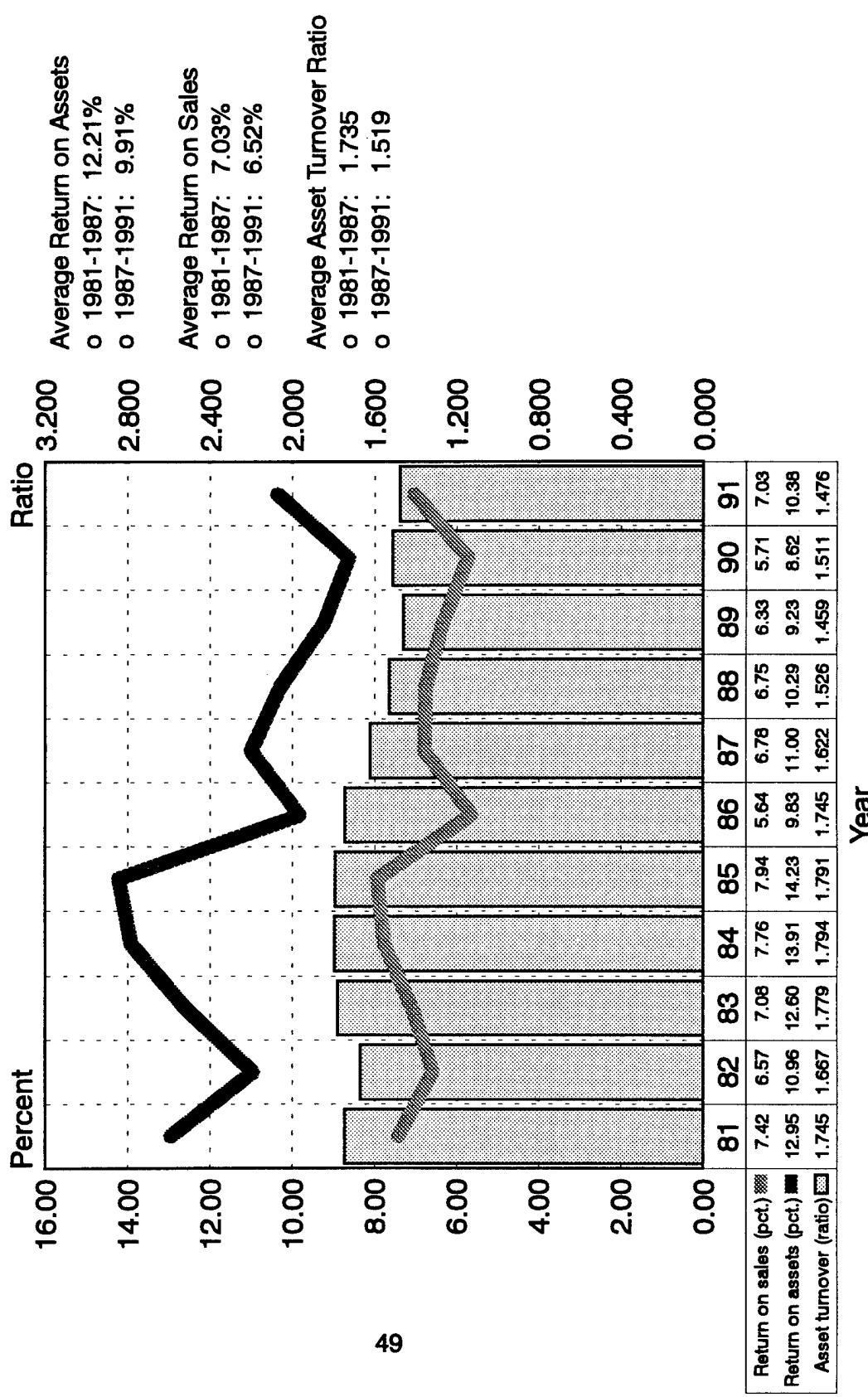


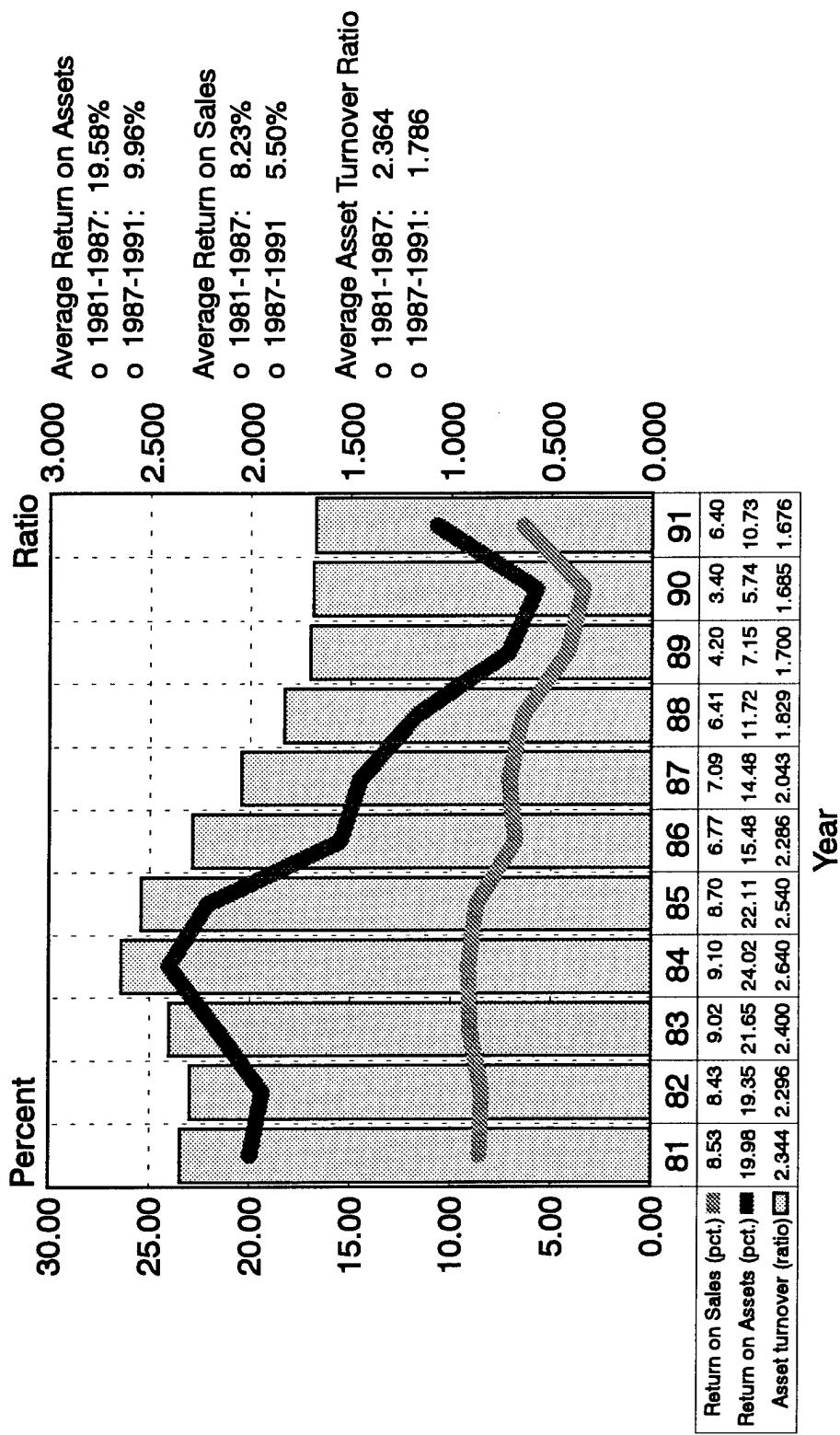
FIGURE E.11
AEROSPACE/DEFENSE INDUSTRY
TOTAL CORPORATE PROFITABILITY



SOURCE: S&P's Stock Reports and DRI/McGraw-Hill

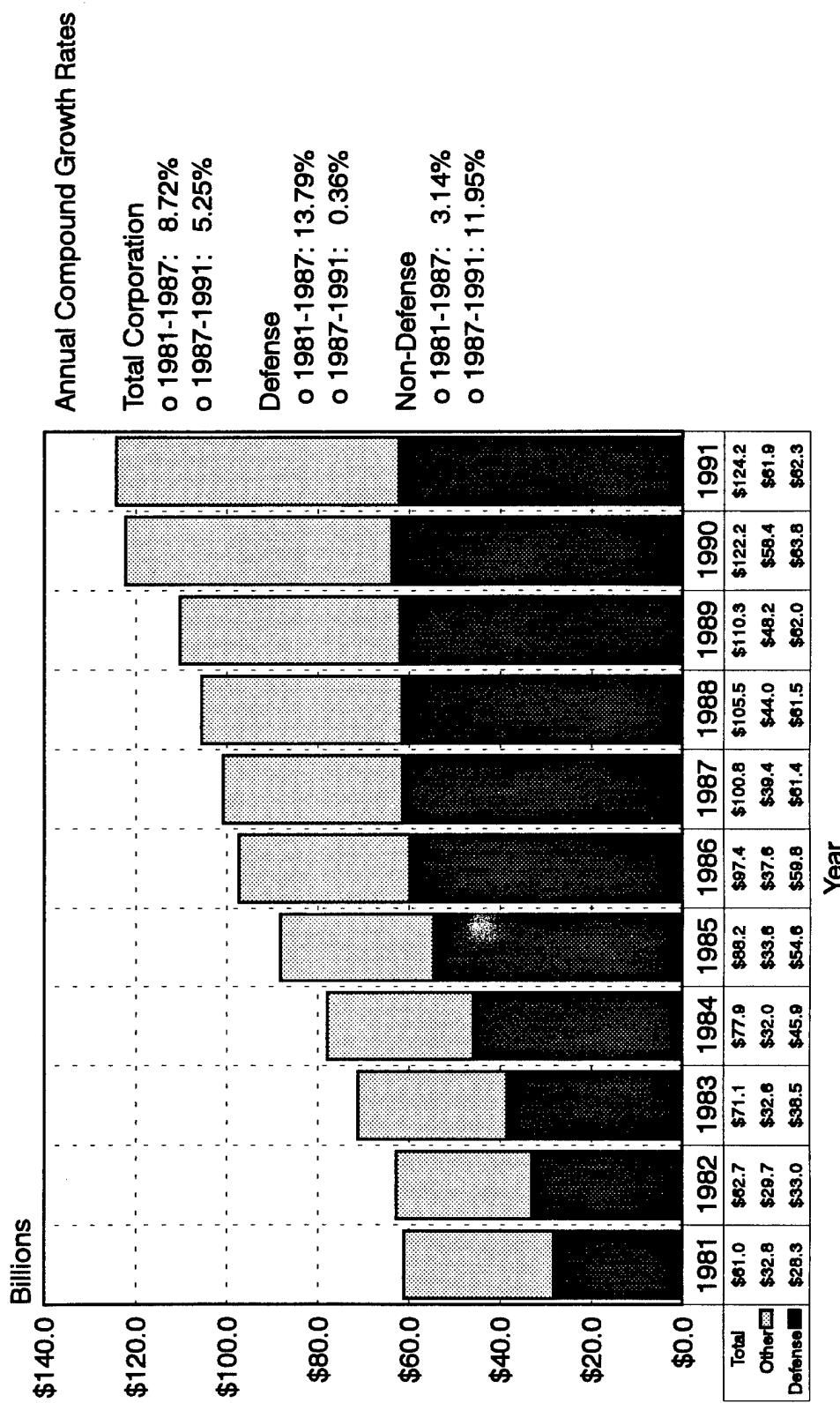
FIGURE E.12

AEROSPACE/DEFENSE INDUSTRY
DEFENSE SEGMENT PROFITABILITY



SOURCE: Martin Marietta, Navy Dept., and DRI/McGraw-Hill

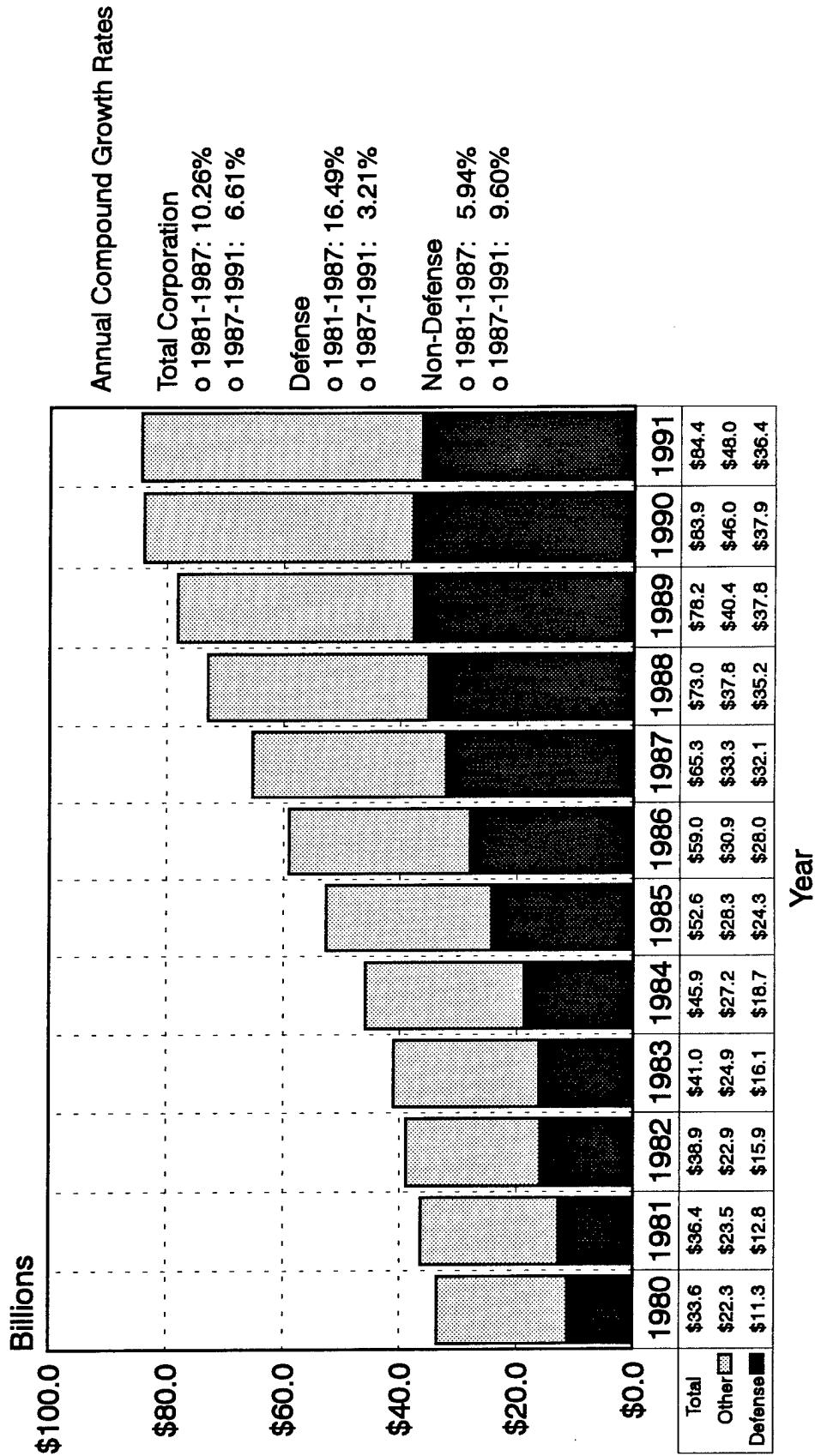
FIGURE E.13
AEROSPACE/DEFENSE INDUSTRY
DEFENSE AND NON-DEFENSE SALES



SOURCE: Martin Marietta and S&P Stock Reports

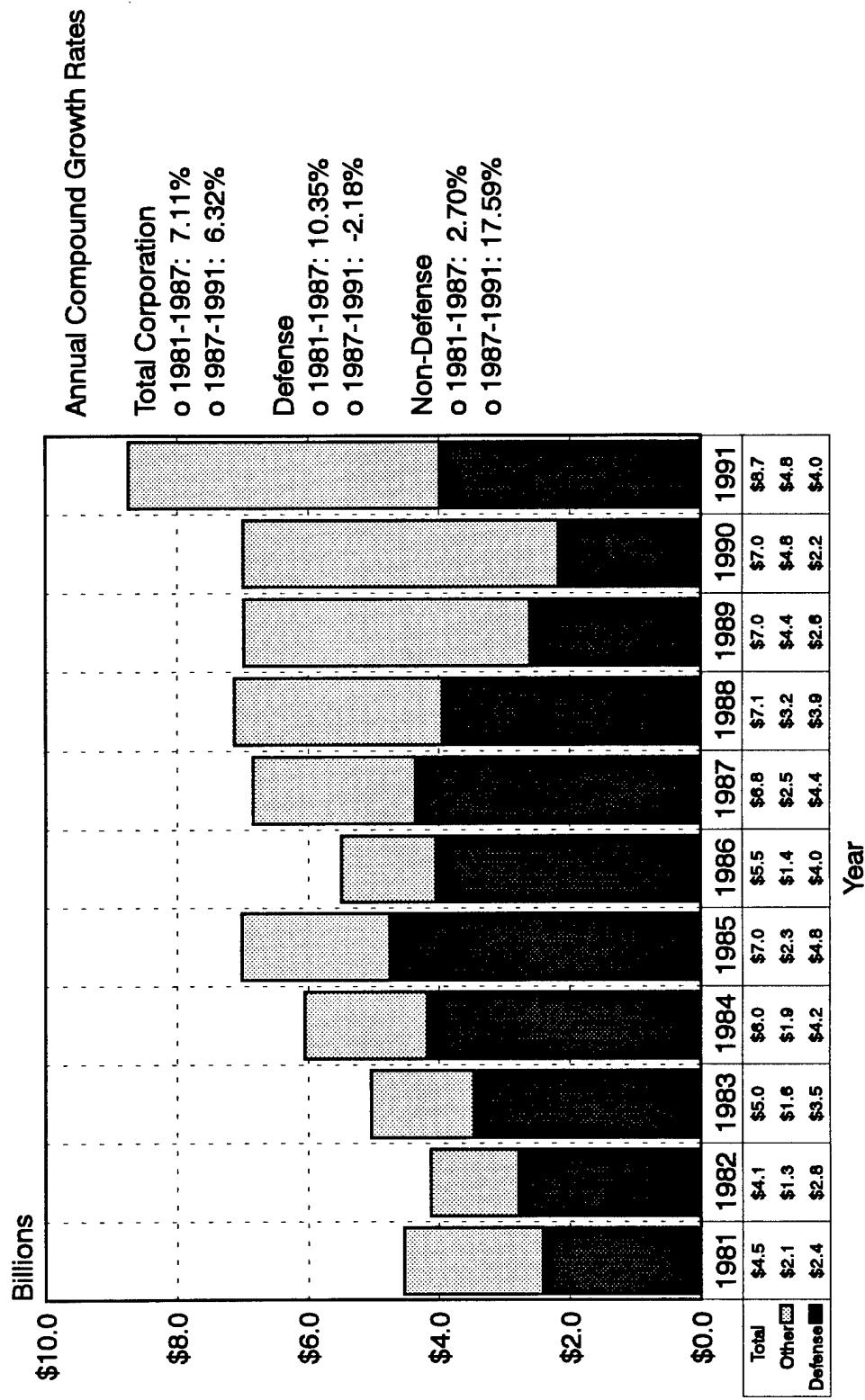
FIGURE E.14

AEROSPACE/DEFENSE INDUSTRY
DEFENSE AND NON-DEFENSE ASSETS



Source: Martin Marietta and S&P Stock Reports

FIGURE E.15
AEROSPACE/DEFENSE INDUSTRY
DEFENSE AND NON-DEFENSE EARNINGS



SOURCE: Martin Marietta and S&P Stock Reports

FIGURE E.16
TOP DoD PRIME CONTRACTORS
TOTAL CORPORATE PROFITABILITY

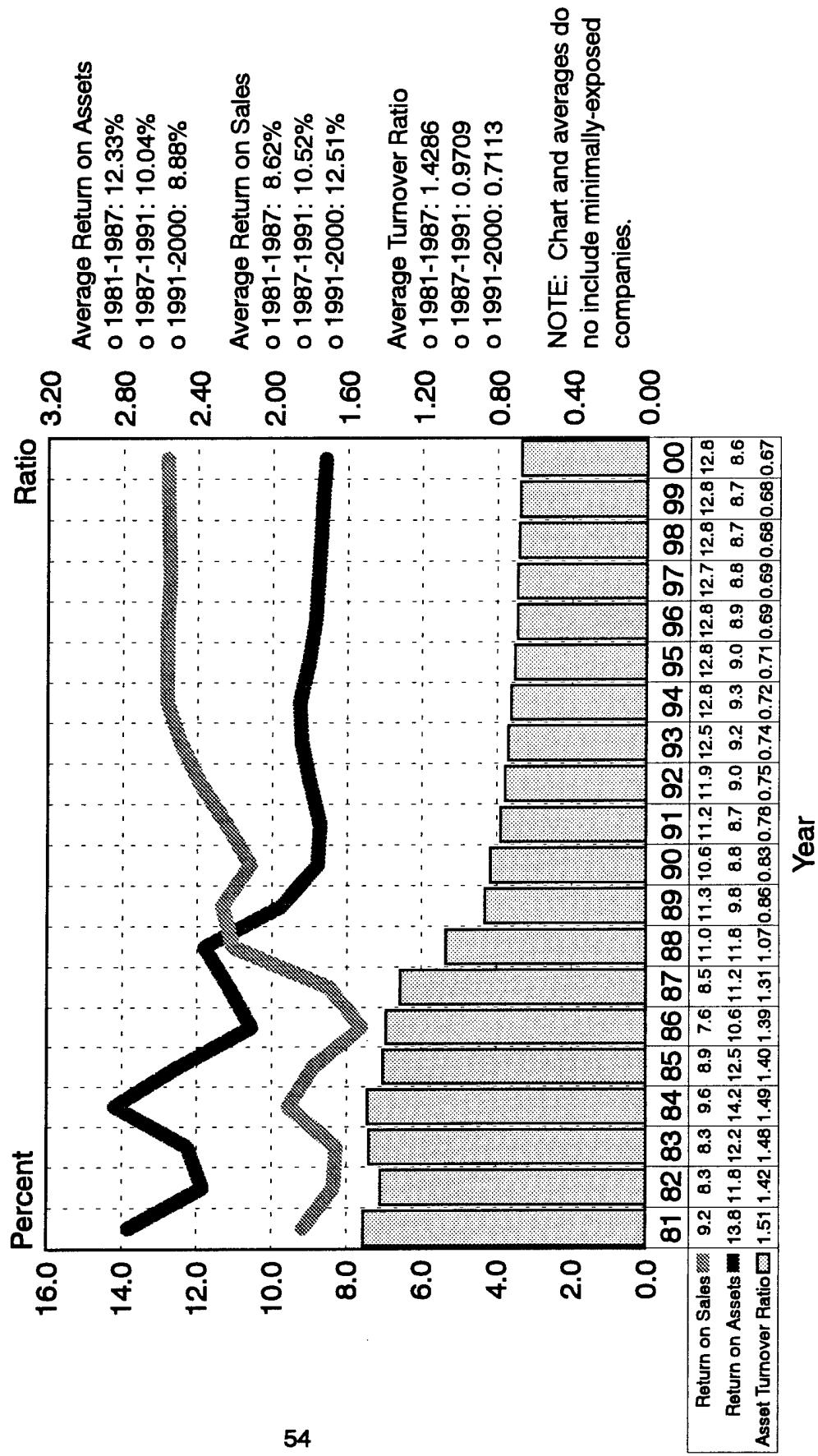
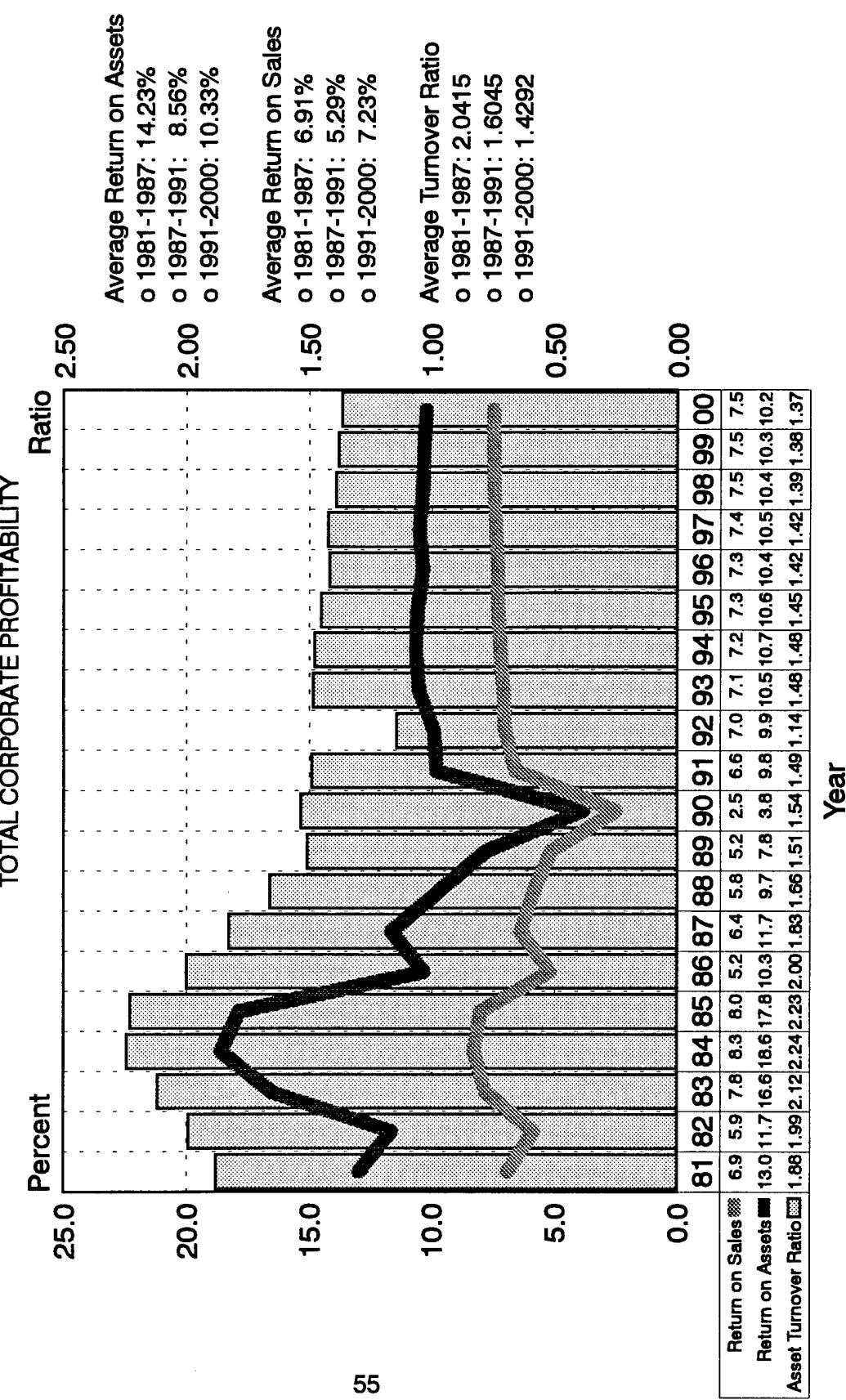
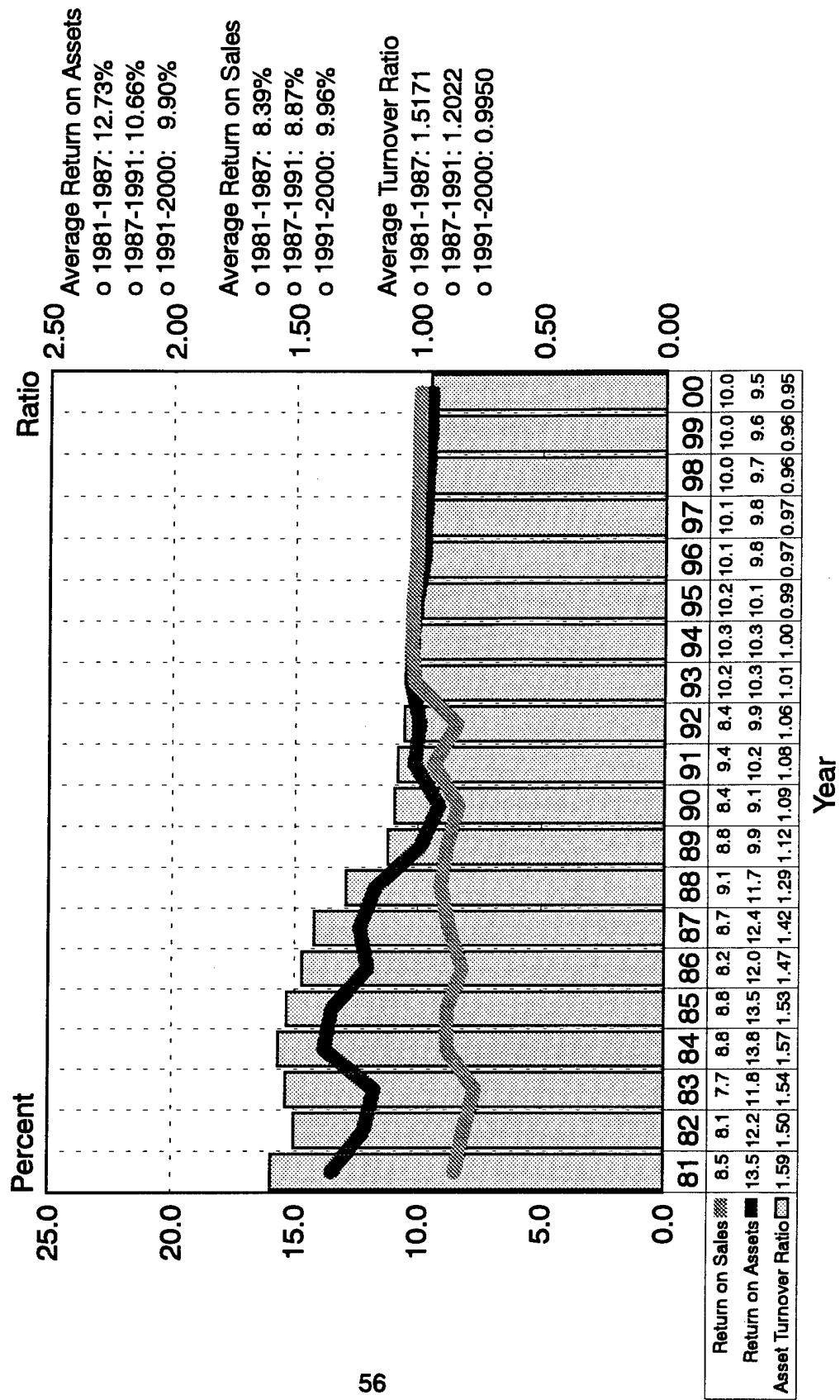


FIGURE E.17
EXTREMELY EXPOSED PRIME CONTRACTORS



SOURCE: S&P Stock Reports and DRI/McGraw-Hill

FIGURE E.18
HIGHLY EXPOSED PRIME CONTRACTORS
TOTAL CORPORATE PROFITABILITY



SOURCE: S&P Stock Reports and DRI/McGraw-Hill

FIGURE E.19
MODERATELY EXPOSED PRIME CONTRACTORS

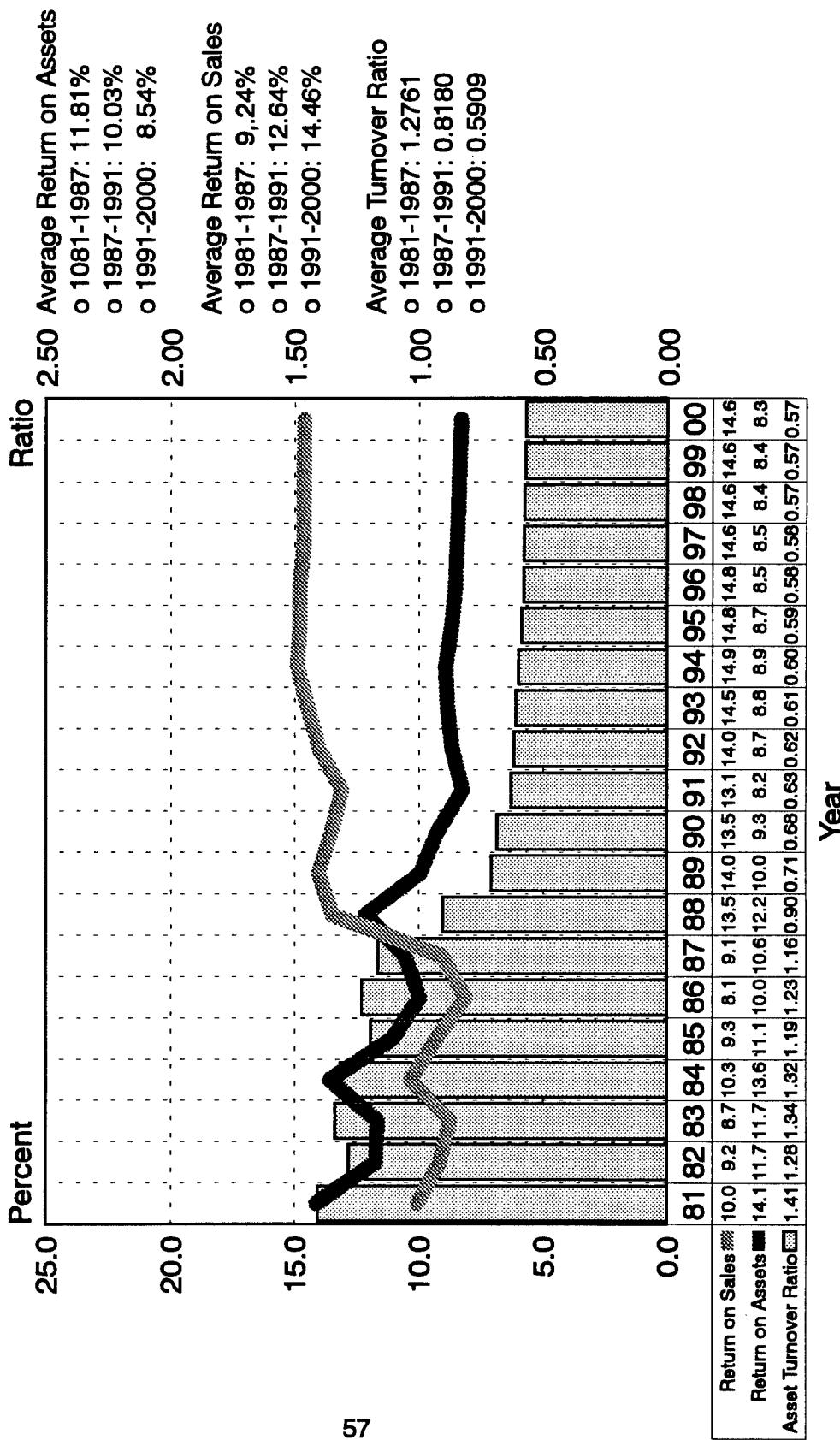
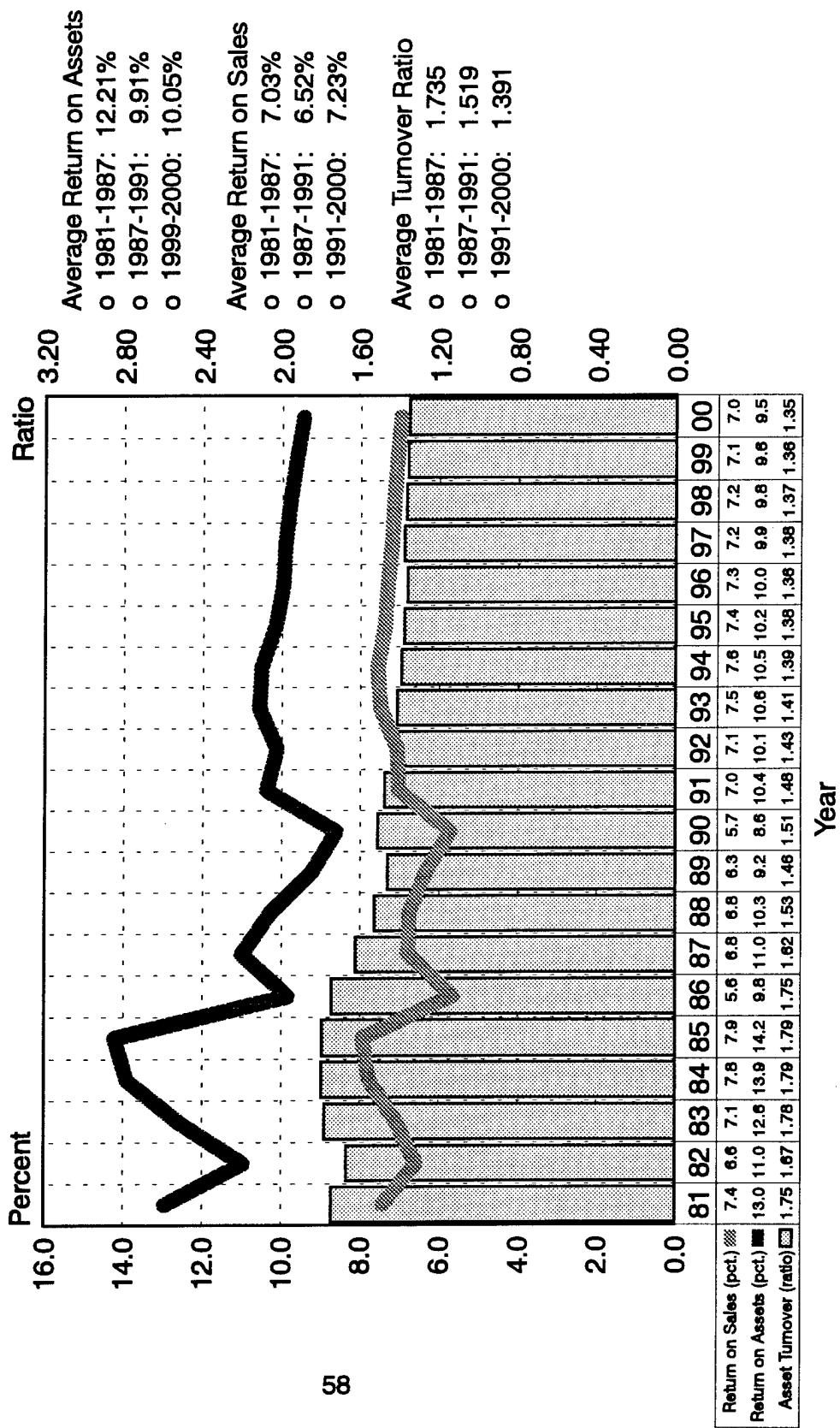


FIGURE E.20
AEROSPACE/DEFENSE INDUSTRY
TOTAL CORPORATE PROFITABILITY



SOURCE: S&P Stock Reports, Navy Dept., and DRI/McGraw-Hill

TABLE E.1
Top DoD Prime Contractors

COMPANY	Fiscal Year 1991		Fiscal Year 1987	
	VALUE (\$000)	Rank in the Top 100	VALUE (\$000)	Rank in the Top 100
McDonnell Douglas	\$8,057,307	1	\$7,715,243	1
General Dynamics	7,848,241	2	7,040,956	2
General Electric	4,866,488	3	5,801,795	3
General Motors	4,427,169	4	4,081,723	5
Raytheon	4,089,761	5	3,819,984	6
Northrop	3,319,215	6	1,068,222	23
United Technologies	2,825,134	7	3,587,022	8
Martin Marietta	2,689,206	8	3,726,483	7
Lockheed	2,666,573	9	5,573,547	4
Grumman	2,363,479	10	3,392,714	10
Westinghouse	1,811,664	11	1,684,123	17
Rockwell	1,707,779	12	2,237,847	12
Litton Industries	1,600,954	13	2,035,397	14
FMC Corporation	1,466,587	14	743,691	28
Unisys	1,378,865	15	2,267,911	11
Loral Corporation	1,282,918	16	691,656	32
Boeing Company	1,166,449	18	3,547,343	9
TRW	1,092,363	19	1,135,038	21
Textron	996,917	20	1,546,349	18
Texas Instruments	982,078	21	1,109,377	22
ITT	947,522	22	995,127	24
Alliant Techsystems	826,640	25	2,007,993	15
GTE	801,425	26	1,475,075	19
Allied Signal	688,555	29	943,001	25
<hr/>		<hr/>	<hr/>	<hr/>
	\$59,903,289		\$68,227,617	

Contract Awards	
Total (>\$25k)	\$136,677,443
Total	\$150,855,267

Percentage	
Total (>\$25k)	43.8%
Total	39.7%

SOURCE: DIRECTORATE FOR INFORMATION OPERATIONS
AND REPORTS (DIOR), WASHINGTON HEADQUARTERS
SERVICES (WHS), DEPARTMENT OF DEFENSE

NOTE: GENERAL MOTORS DATA INCLUDE HUGHES
ALLIANT IS A "SPIN-OFF" OF CERTAIN HONEYWELL DIVISIONS

TABLE E.2
Top DoD Prime Contractors

1991 Revenues
(\$ Millions)

COMPANY	DEFENSE/SPACE	TOTAL	PCT.	CATEGORY
Alliant Techsystems	\$1,187	\$1,187	100.0%	Extremely Exposed
Grumman	3,597	3,963	90.8%	
Northrop	5,100	5,694	89.6%	
Martin Marietta	5,200	6,075	85.6%	
Lockheed	8,340	9,809	85.0%	
General Dynamics	7,400	8,751	84.6%	
Loral Corp.	2,170	2,882	75.3%	
McDonnell Douglas	\$10,150	\$18,432	55.1%	Highly Exposed
Raytheon	5,000	9,274	53.9%	
Hughes	5,800	11,700	49.6%	
Litton Industries	2,450	5,219	46.9%	
Textron	3,423	7,822	43.8%	
Rockwell	5,200	11,927	43.6%	
TRW	3,111	7,913	39.3%	
FMC Corp.	1,172	3,899	30.1%	
Texas Instruments	\$1,890	\$6,784	27.9%	Moderately Exposed
Unisys	2,350	8,696	27.0%	
United Technologies	5,500	21,262	25.9%	
Westinghouse	3,245	12,794	25.4%	
Boeing Company	5,846	29,314	19.9%	
Allied Signal	2,213	11,831	18.7%	
General Electric	7,300	59,379	12.3%	
ITT Corp.	\$1,201	\$20,421	5.9%	Minimally Exposed
General Motors	6,800	122,081	5.6%	
GTE	1,000	19,621	5.1%	
<hr/>				
	\$106,645	\$426,730	25.0%	

SOURCE: DRI/MCGRAW-HILL

NOTE: REVENUE DATA PERTAIN TO CALENDAR YEAR

TABLE E.3
 Comparison of the Key Differences Between
 Civilian Firms and Defense Firms

Characteristic	Civilian - Oriented Firm	Defense-Oriented Firm
Products	Low technology	High technology
Market structure		
Demand	Competitive	Monopsonistic
Supply	Competitive	Oligopolistic
Prices	Constrained by market competition	Determined or influenced by government
Outputs	Constrained by market competition	Determined by government
Financing	Security markets	Federal government
Burden of risk	Borne by the firm	Divided between government and the firms
Managerial discretion	Relatively wide	Severely constrained
Profits	Constrained by market competition	Regulated via contract

SOURCE: Murray Weidenbaum Small Wars, Big Defense: Paying for the Military After the Cold War (p. 144).

TABLE E.4
 Annual Compound Growth Rates for Sales
 and Assets for Top 25 Prime Contractors
 for Selected Periods

	1981-1987		
	SALES	ASSETS	ASSETS/SALES
Extremely Exposed	12.56%	14.06%	1.12X
Highly Exposed	6.09%	8.00%	1.31X
Moderately Exposed	6.66%	9.79%	1.47X
Minimally Exposed	5.53%	9.50%	1.72X
TOTAL 25 PRIMES	6.66%	9.67%	1.45X

	1987-1991		
	SALES	ASSETS	ASSETS/SALES
Extremely Exposed	0.36%	4.22%	11.72X
Highly Exposed	5.11%	11.52%	2.25X
Moderately Exposed	8.28%	25.68%	3.10X
Moderately Exposed	6.56%	21.23%	3.24X
TOTAL 25 PRIMES	6.29%	20.67%	3.15X

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